TECHNOLOGY DEPARTMENT

The
CHEMICAL AGE

VOL LX | 11 JUNE 1949 | No 1561

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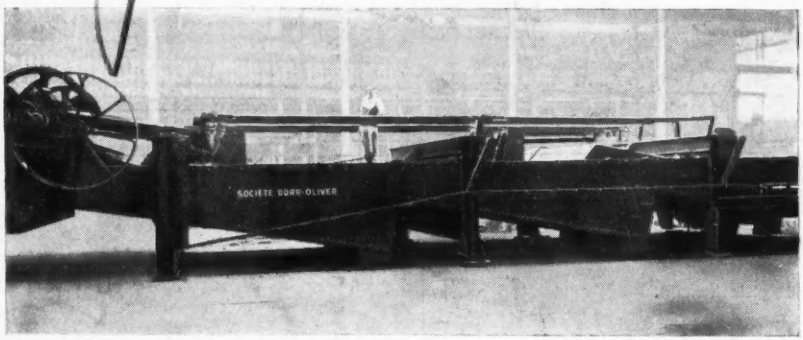

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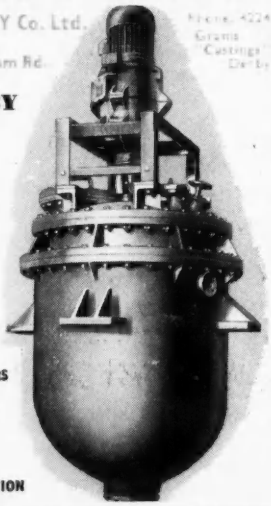

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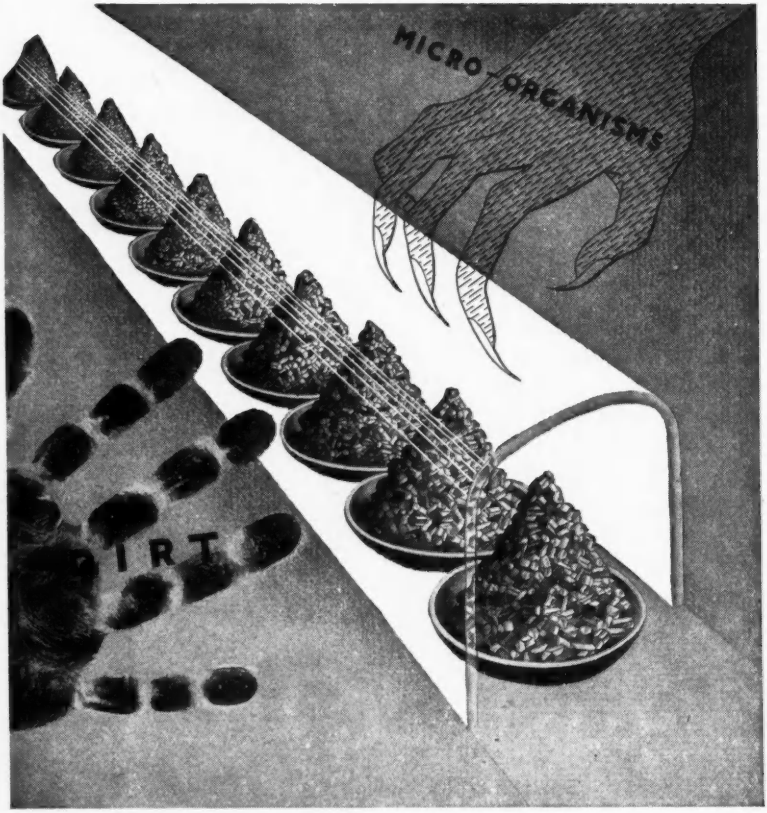

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P.326

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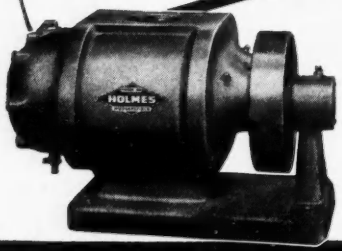

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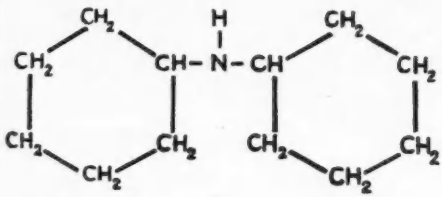

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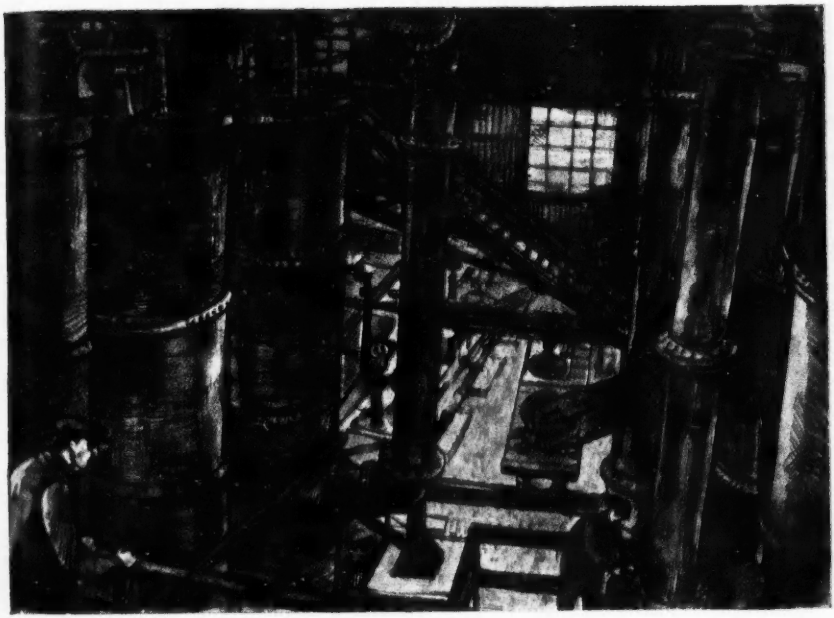

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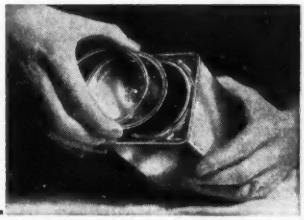

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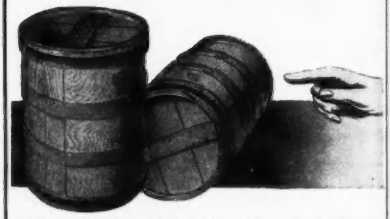

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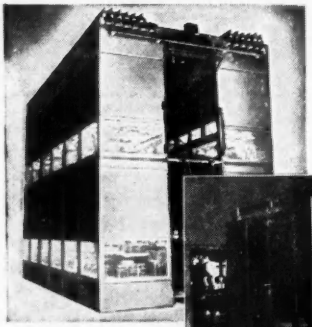

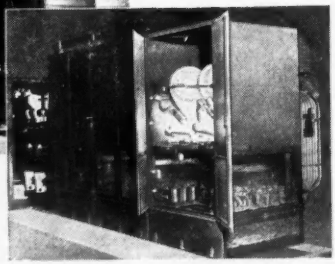

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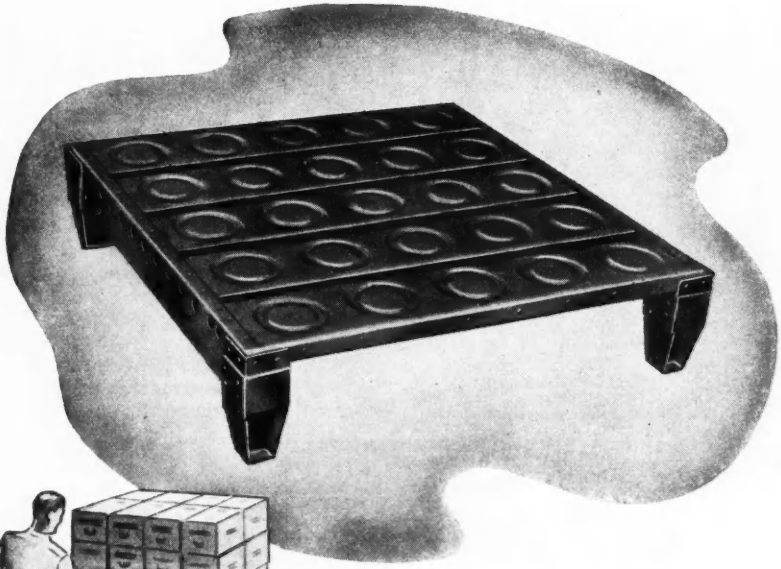

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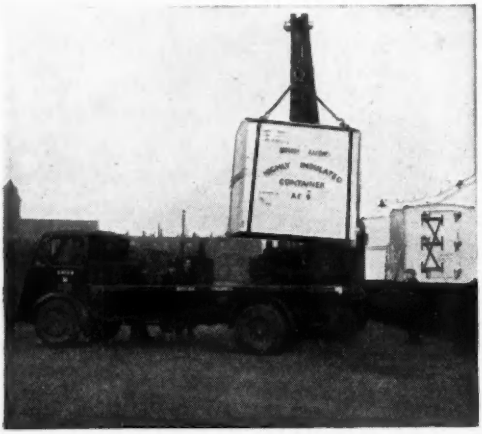

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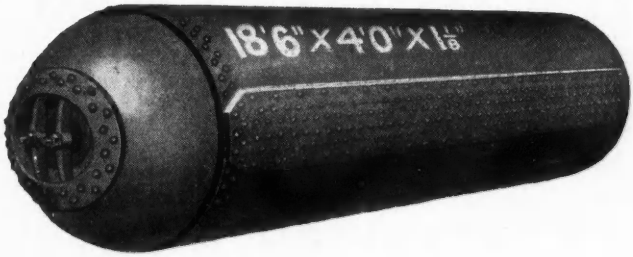

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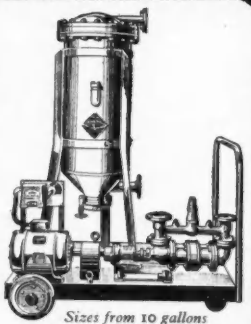

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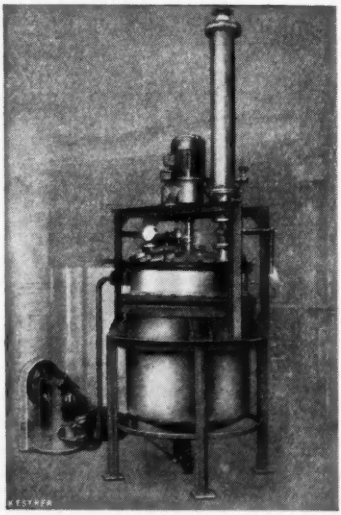

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FRONT VIEW

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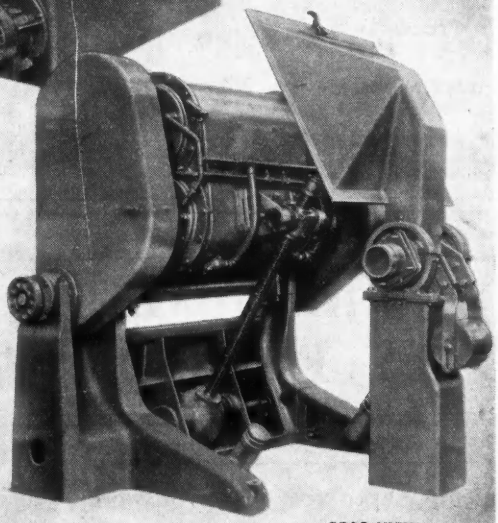

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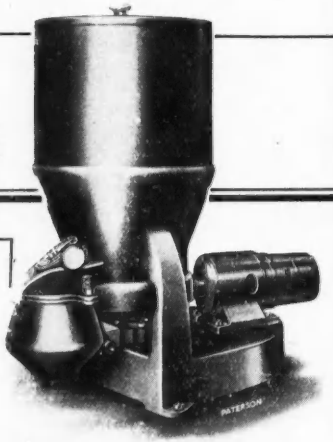

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SCOTTISH OFFICE:
116 Hope Street, Glasgow (Central 3970)

MIDLANDS OFFICE:
Daimler House, Paradise Street, Birmingham (Midland 0784-5)

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Rewards and Research

IF scientists were susceptible to flattery the contemporary readiness to applaud their achievements, the wish to see their tribe increase and, above all, the bids to enlist their support for one political order of society might combine to distract their attention from their real purpose in life. It is a very fortunate thing that all who have devoted themselves to science and especially those who are producing the most significant results are too absorbed by the work in hand to pay overmuch regard for the plaudits of those who, like old Kaspar, only know that " 'twas a famous victory." The splendid mantle of Hollywood would in any case be an ill-fitting substitute for the gown or the laboratory overall.

The latest evidence of this siren's song comes in the form of a twopenny booklet, " New Deal for Science," produced at the instigation of the national executive committee of the Labour Party. It is said to embody the recommendations of the committee towards the shaping of present Government policy and " to emphasise the dangers of prejudice against the application of science and to demonstrate how much the Labour Government has done for science in its first term of office." Whatever are the facts about the existance of " prejudice " there is no doubt at all that in the years since the war more has been written or proposed to give wider scope to the operations of scientific workers, and especially of chemists, than in any comparable period. It has been equally obvious that the whole trend of events in industry, following the widespread changes in traditional procedures introduced by war needs, must in any case have had that result, and that whatever has been gained for science and its practitioners was paid for in advance by the extraordinarily rich returns yielded by recent scientific research.

That, however, is of small concern to the Socialist publicists, who differ markedly from the scientific worker in their alacrity in claiming credits; and it must be acknowledged that their claims are expertly presented, even if they embrace a good deal more than can honestly be attributed to Socialism, or any other one brand of legislation. The " New Deal for Science " is in fact a very competent and wide-ranging review of most of the factors which are changing the prospects of the future integration of science with industry and with society at large, and the unjustifiable implication that all this is somehow associated with the predominance of Socialism in State affairs does not altogether obscure the interest attaching to some of the matters which are now presented.

The writers are on safe ground in their treatment of some urgent factors in the familiar problem to which the Barlow Committee called attention over two years ago —the inadequacy of existing training estab-

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lishments to supply the rising numbers of qualified scientists and technicians needed by industry. There is in particular potentially wide agreement for the proposition, intimately associated with the fuller provision of scientific training, which is restated here: that the more gifted young scientific workers are almost irrestibly diverted away from service in the universities by the very much higher payment offered by industry, and the more liberal opportunities for individual research.

The Labour Party pamphlet states a case in this connection to which there should be very little opposition. It is summed up in its conclusion that: "It is therefore necessary that increases be made in the salaries of university teachers, especially in the lower grades. The academic scientist is often in his most creative phase between the ages of 25 and 35. If his power to impart enthusiasm to his pupils, and not less important, to forward his research work, is to be maintained at a high level it is essential that he be freed from financial worry. The financial inducement for a young scientist to become a schoolmaster is even less attractive." The more attractive course, the pamphlet acknowledges, is to accept the fuller facilities for research with comparative freedom which industry offers. This, however, is the point at which the fundamental inconsistency of the political approach to the promotion of science becomes evident. Despite the inestimable value of the help given by industrial units as interested patrons of research, the pamphleteer implies that this is also to be deplored because occasionally it temporarily deprives the scientist of the right to publish the results of his work . . . "Greater freedom of publication . . . may never be complete as long as there are profit-making private firms."

Although the evident implication here is that the goose should now be killed, regardless of the golden eggs, it is suggested, presumably as a temporary expedient, that scientists should create a professional code to preserve their right to publish results of work done for private firms, "unless there were the strongest reasons to the contrary." The liberty enjoyed by doctors, which is cited to support the argument, is unfortunately a false analogy. Classical research in medicine does not generally owe its existence to the massive foundations of money and equipment which private industry has placed within reach of the "commercial" research worker. It is interesting to speculate how long the vast organisation of private industrial research would survive in the unlikely event that all its scientific workers heeded this injunction that their findings should be "free for all."

NOTES AND COMMENTS

New Trojan Horse

A DISMAL example of the enmity and disruption which may be sown in scientific circles as remote as the American by the generally discredited 500-page report of Lysenko on the results of "the new genetics" in Soviet agriculture is the storm which has recently gathered round the Oregon State College and one of its teaching staff, Dr. Spitzer. The latter, whose contract is not being renewed, was said to have shown "excessive sympathy" for the Soviet brand of scientific thought, which a letter of his to *Chemical and Engineering News* calling for reconsideration of the Lysenko-Michurin proposition and of Soviet science as a whole strongly suggested. The depth of feeling which such an incident can arouse—in the U.S.A. —has been shown by the series of letters which has ensued, among them a defence of Dr. Spitzer by Prof. Linus Pauling, president of the American Chemical Society, as well as by the violent attacks which are invited by any hint of compounding with the abhorrent policies prevailing in Russian scientific affairs. The wretched outcome of all this is that a competent American science teacher has been penalised for sympathising with an ostensibly scientific contribution from Russia. The derision which the genetics theory has aroused generally should not debar Dr. Spitzer or anyone else from entertaining it if he wants to. It is lamentable that the repellent character of Soviet "politico-science" has endowed some of its fruits with the disruptive capacity of the Trojan horse.

The Insect War

MOST current literature concerned with the many sided campaign being waged so effectively with chemicals to check the vast inroads made by insects on the world's food supplies concentrates on the defence of growing crops. That aspect is, of course, little more than half the story, for the attack upon such crops as cereals and seeds of many kinds does not end with the harvest. While none of the estimates of the loss in store of wheat alone can purport to be comprehensive, all alike help to make clear the vast scale of the destruction and the corresponding importance of anything that chemistry or any related method can do to arrest it. The tactics of these beneficial exercises in "chemical warfare" have now been authoritatively described for the first time by those who carried it on in the critical period 1940-1947—the Pest Control Laboratory (DSIR), whose description, principally of gas attacks, upon insects infesting bulk grain stores forms the most significant section of the current report of the Pest Infestation Research Board. The laboratory which, it is now being recalled, was the first to call attention to the extreme toxicity to house-flies of DDT, has provided some data almost as promising in the realm of disinfestation of wheat, groundnuts, and similar stores by various fumigants—hydrogen cyanide, ethylene oxide and dichloride and methyl bromide. ("Pest Infestation Research, 1947"). The study would have been very much simpler, but for the fact that the most effective of these are a good deal more toxic to men and animals than is DDT and are very subject to sorption. Inert dusts, such as felspar, dolomite and anhydrite, are capable of destroying granary weevil, but the dangerous dust clouds to which they would give rise make them a two-edged weapon. The most successful instrument at this stage is thought to be methyl bromide, on which work is still continuing.

Improvised Equipment

THE unforeseen complexity of all such investigations is revealed in some of the incidental records included in the Pest Control Laboratory's report. Half the natural sciences it seems have to be called in to plan and execute an effective attack upon the insect world, whose capacity for passive defence and evasive action verges on the miraculous. Not all the present resources of the laboratory completely fulfil the needs of this kind of research. This is brought out in the laboratory's note on the difficulty of measuring the relative humidity of air in confined spaces and the individual method that was adopted, using the colour change undergone by cobalt salts. After considerable experimentation, it is recalled, a technique was evolved whereby strips of paper impregnated with

cobalt thiocyanate are exposed to the atmosphere to be tested and then immersed in oil (to prevent further colour change) and matched against standards, these being similar strips of impregnated paper, exposed to a range of precisely known humidities, immersed in oil and hermetically sealed under glass. With practice it is possible to measure relative humidity to within ±1 per cent by this means. The technique can also be used to measure the water content of samples of grain or other material, relying on the fact that in a confined space the relative humidity of the inter-granular air is in equilibrium with the moisture content of the material under examination. That is only one aspect of the inventiveness called into play, producing several other ingenious techniques, such as the accurate estimation of the presence of insects in grain by emission of heat or of carbon dioxide from the grain sample.

The Versatile Paper Chemist

AS a formula for a full life the normal destiny of the paper makers' chemist may be taken as providing all the elements required to banish tedium. That is the picture of this particular branch of chemistry which was outlined recently at the Medway Technical College by Mr. R. Carter, himself a paper chemist of some distinction. The chemist in the paper industry needs to be more versatile than almost any of his brethren, according to the summary given by Mr. Carter to the London and S.E. Counties branch of the Royal Institute of Chemistry. He needs to be a technician equally as much as a scientist, to have more than the normal capacity for improvisation and, almost as indispensable, he will need a sense of humour. The course of events in a paper works does not follow any classical precedent and the chemist there will need a taste for the unorthodox and the capacity for retaining his poise when the unexpected happens. Those qualities are to a large extent the fundamental equipment of all chemists who have to adapt chemical principles to the exacting and generally wayward courses of industry, but they are obviously essential to the man who may have to translate laboratory-scale operations to systems of up to 150,000 gal. capacities, in which, incidentally, the performance of reasonably accurate sampling is itself a problem calling for ingenuity of a high order. The evidence of laboratory experiments may be meaningless and pilot plants are usually too expensive to be practicable. Fortunately, as Mr. Carter observes, the chemist is being relieved of the "lone wolf" rôle in the scientific direction of paper making, which is providing growing scope for the activities of the physicist and the chemical engineer.

Goethe the Scientist

CELEBRATIONS in August commemorating the bi-centenary of the birth of Goethe should not be devoid of interesting associations for the natural scientists, because this greatest of German poets applied his genius also in nature and scientific studies. This aspect of that dynamic mind, however, now commands only historical interest, although he himself valued his work in these fields more highly than his poetry. We marvel at the obstinacy with which he, mathematically ill-equipped, opposed the Newtonian theory of light and colour. Of real importance, on the other hand, was his foreshadowing of the Darwinian theory in his work on the metamorphosis of plants, and in biological morphology. Particularly advanced, in his generation, was his understanding attitude towards modern industry, in which steam was just beginning to set in motion a revolution. His life falls into the time when the true evaluation of the value of applied chemistry was beginning to be made. A lecture delivered at Oxford by Sir Charles Sherrington, O.M., "Goethe on Nature and on Science," which has recently been published in book form by the University Press, Cambridge, presents both a summary and judgment of Goethe's work. "We are confronted", writes a reviewer in *Nature*, "with the question as to how a man of so much mental power, vision, and industry could devote so much time to the problems of science without leaving any mark in the history of science. Towards a solution of this question . . . Sherrington's lecture contributes more than many ponderous works."

Whale Oil Record.—The whale factory ship *Southern Harvester* (22,000 tons) has lately reached Liverpool, after a seven months' voyage in the Antarctic, with the season's record cargo of whale oil.

SCIENTIFIC STUDIES OF PAINT FAILURE

New Speculations at OCCA Conference

THE remarkable advance made in comparatively recent times in the scientific approach to problems raised when paint films break down was made evident by several papers and the discussion heard at the recent national conference at Rothesay, S.W. Scotland, of the Oil and Colour Chemists Association. Characteristic of the extent of the advance in the application of chemical and physical knowledge in this sphere was the open discussion on the subject of paint blistering.

Dr. J. E. O. Mayne, who opened the discussion, mentioned two experiments which he and his colleagues had made. If a piece of glass coated with polystyrene was placed in distilled water, blistering would occur in about a fortnight. One could examine the blisters from the back, since the glass was coated only on one side and there was nothing in the blisters except gas; there was no liquid. If a piece of glass similarly coated was placed in sea water, there would be more blisters.

Osmotic Effects ?

His interpretation of that was that a film placed in water would take up water only until the vapour pressure of the water in the film was roughly of the same order as that of the water outside it. As a result, the film would expand and pull itself off the glass. Then, owing to lowering vapour pressures, it would take up less water and there would be less blistering.

Secondly, if a piece of steel coated with polystyrene was placed in sea water for a month, blisters would occur and they would be filled with liquid. On the other hand, if one used distilled water one would not get that type of liquid in blisters; he had not been able to get liquid-filled blisters from fresh water.

If the liquid from the liquid-filled blisters was extracted, one would find that it was 1.1 normal caustic soda; it contained no chloride ions and no magnesium. The reason that the film immersed in fresh water did not reveal liquid-filled blisters was that there were no sodium ions.

Dealing with the question of how the liquid-filled blisters formed, Dr. Mayne said that by the use of a certain type of cell apparatus, using a capillary on one side, he had attempted to obtain osmotic transfer from sea water to 1.1 caustic soda, but he had not been able to do so. There was indication that the blistering in those cases was due to electro endosmosis. A polystyrene membrane appeared to take up a negative charge when placed in sea water.

Asked what was the position with regard to other resins, Dr. Mayne said he had examined only linseed oil, and there was evidence that that had a negative charge. He believed there were some carboxyl groups in polystyrene, sufficient to give an electrical charge.

The point he wanted to make was that osmosis might well play a part in the blistering, but he did not think a satisfactory case had been made out until one had done three things; first, shown that the blisters contained liquid; second, that the liquid was of higher osmotic pressure than sea water, and, third, had set up a cell and had obtained an osmotic transfer through the membrane.

Differing Surfaces

Dr. H. W. Keenan commented that two very opposite views had been put forward, and he felt that both of them neglected one important factor. In experimentation it did not matter whether the film was on glass or metal or something else. If one drew a critical theory, such as that put forward by Dr. Mayne, it was necessary to take into account the fact that the dimensions were also critical and, unless one was working with plane surfaces, one lost sight of the fact that in some cases the film was spanning quite considerable troughs. He believed it had been shown that if one used a planometer one would find considerable differences between what appeared to be plane surfaces.

Unless one was applying to optically flat surfaces a theory such as that put forward—which was absolutely critical and must therefore apply in all cases—one was really showing in some cases osmotic pressure differences, especially where there were troughs in the surfaces, for it was to be expected in those cases that the permeability would obey a fixed law and there would be electrical dimensions. In other cases it would be found that Dr. Mayne's theory was true. That was a point to be considered if one was getting down to the academic aspect of the problem.

No Exchange

Dr. Mayne said that might be so, but before one could attribute blister formation to osmosis it must be shown that inside the troughs there was a liquid of higher osmotic pressure than that of sea water, and that the film was really semi-permeable. He had tried the effect of the sea water on

one side and distilled water on the other side of a linseed oil film, but could not produce any movement of water through the film at all. There was no movement of the meniscus in a capillary tube, apart from a slight movement due to evaporation loss, which was very minute.

He had not been able to get osmotic transfer through any type of paint film, and he maintained that the case for osmosis was not valid until someone had done that. The effect could be interpreted on the basis of electro endosmosis, and it was possible that osmosis would play a part.

Replying to another questioner, Dr. Mayne pointed out that if one was to attribute blistering to electro endosmosis, as he had done, there must be corrosion before blistering could occur, because there must be a current passing and it was the passing of that current through the negatively charged membrane that caused the water transfer. Elm's view was that 95 per cent of blistering was due to electro endosmosis and only 5 per cent was due to osmosis.

With regard to bubbling or blistering on films, Dr. Mayne said he did not think it was due always to corrosion. Recently he had investigated complaints of blistering on gasholders where blistering was more in the nature of bladdering and took place over the undercoat, which latter was still quite hard. He suggested that possibly the trouble was due to the layer of finish absorbing water, becoming soft and losing adhesion. Then water passed through the film, which lifted, for it was already under compression due to expansion during drying.

Behaviour of Polystyrene

Asked how he explained, on his electrical theory, why blisters should develop at all, as when one saw them growing it seemed rational to regard that occurrence as an osmotic effect, Dr. Mayne said a polystyrene film was permeable only to positively charged ions, so that corrosion could proceed, sodium ions could go in and corrosion products were accumulated in the blisters. So far as he could see, the blisters reached a certain size and then stopped growing, and he suspected it was due to precipitation of magnesium hydroxide in the walls, which increased resistance, so that the sodium active cathodes were thrown to another spot.

Dr. Mayne said he wanted to make it clear that he did not claim that osmosis did not function, but merely that the case for osmosis had not been entirely made out.

AID FOR AUSTRIAN STEEL

APPROVAL of two basic recovery projects for Austria, one for a continuous billet mill at Donawitz and the other to rehabilitate iron ore mining in the historic Erzberg field, Styria, has been announced by the Economic Co-operation Administration.

The new continuous billet mill at Donawitz will replace obsolete plant. The cost estimated at $7,230,000, includes $3,451,000 in ECA assistance funds, the remainder coming from local sources. With the new equipment, capacity of the mill is expected to reach 33,000 tons of semi-finished and finished products per month as against the present rated capacity of 25,000 tons per month.

At Erzberg, 1948 iron ore production was only 980,000 tons compared to average pre-war production of 2 million tons annually. The mining concentration and transport equipment necessary for the rehabitation project is expected to increase present production by 57 per cent, while increasing the labour force by only 19 per cent. The new equipment and increased output are expected to bring about lower costs per ton. Total cost of the Erzberg project is estimated at $5,200,000, including $2,145,267 in ECA assistance funds and 30,616,000 schillings ($3,060,600) in local funds.

In each case the ECA funds will be used largely for purchases in the U.S.A.

DISMANTLING IN GERMANY

AN official British announcement issued from Düsseldorf stated that dismantling would begin on June 8 at the four Fischer-Tropsch synthetic oil and chemical works in Wanne-Eickel, Dortmund, Castrop-Rauxel, and Bergkamen. In all, six Fischer-Tropsch, three Bergius, and two artificial rubber plants are scheduled for dismantling under the terms of the Washington Agreement.

German Technical Information

The following reports on German industry, published on June 4, are obtainable from H.M. Stationery Office:

BIOS 1330. (BIOS 394) Vol. III, Part 1—Technical report on Ruhr Coalfield—Report on power stowing in the Ruhr and Saar districts of Germany and the Limburg district of Holland (3s. 6d.). This report has been published separately by HMSO as a Ministry of Fuel & Power publication and should be ordered by the title.

BIOS 1637. Manufacture of Sulphuric Acid, Henkel & Cie G.m.b.H. Dusseldorf-Holthausen (2s.). Information obtained during an interrogation of Dr. Federn (Carl Schenck G.m.b.H.) on matters connected with vibration and shock (6s.).

Classified lists Nos. 18 and 19 are also now available.

Duty on Light Oils

Renewed Demand for Repeal

THE repeal of the 9d. per gal. duty on light hydrocarbon oils used for non-road purposes in agriculture, aviation, a wide range of industrial processes, and in motor manufacture, is called for in an amendment which has been tabled to the Finance Bill. The amendment stands in the name of Mr. F. J. Erroll and a number of other Members of Parliament.

The removal of the duty was recently the subject of representations to the Chancellor of the Exchequer by the two organisations representative of English and Scottish agriculture, seven bodies with aviation interests, 18 trade associations representing a wide range of industrial processes, and the Society of Motor Manufacturers and Traders.

An immediate reduction of one halfpenny a gallon in the price of motor spirit and of diesel oil for road vehicles was announced last week by the Shell Mex and B.P., Anglo-American Oil, and Fina Petroleum Products companies. Fuel for diesel engine road vehicles was reduced by one farthing a gallon on May 27 in recognition of declines in the world market prices.

ANOTHER STEEL RECORD

PRODUCTION of steel in May set up a further record at an annual rate of 16.409 million tons, the previous best output being 16.269 million tons, which was attained last month.

Despite the fine figures achieved last year, it is pointed out by the British Iron and Steel Federation that so far this year each month's figures have been higher than the corresponding month of 1948.

Some slight decline is expected as a result of Whitsuntide, and a fall later in the year during the holiday periods.

Pig iron output was at an annual rate of 9,700,000 tons compared with 9,552,000 tons a year ago. Stocks of pig iron and scrap have been increasing and are appreciably greater than at the beginning of the year.

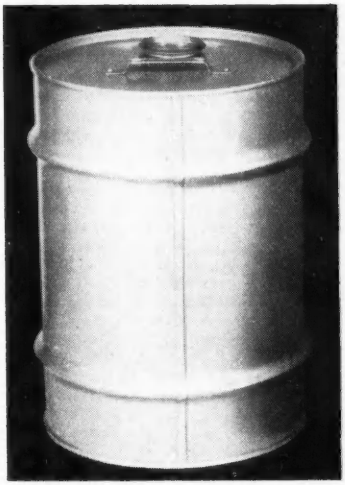
Comparative figures were :—

STEEL INGOTS AND CASTINGS
(Thousands of tons)

	1949		1948	
	Weekly average	Annual rate	Weekly average	Annual rate
First quarter	305	15,850	287	14,933
April ...	305	15,854	294	15,283
May... ...	316	16,409	293	15,220
PIG IRON				
First quarter	179	9,324	175	9,084
April ...	179	9,288	181	9,433
May... ...	187	9,700	184	9,552

Lower Packaging Costs

Use of 24-Gauge Tinplate Drums



Typical transport drum incorporating pressed out roller hoops for added strength

AS a result of extensive experiments, a method of incorporating pressed-out roller hoops in locked side seam packages has now been devised by Reads, of Liverpool. The incorporation of pressed-out roller hoops in a drum body is stated greatly to add to its strength, but while corrugations have been feasible and have been incorporated by some container manufacturers for many years, due to the several folds of metal in a locked side seam, the incorporation of pressed-out roller hoops was hitherto treated as an impossibility.

This new advance in package design, it is thought, will be of great interest to the food, paint and chemical industries in particular, as a 5-gallon package is usually regarded as a non-returnable or one trip package, if the material employed is of light gauge, due to the absence of any strengthening feature. With the incorporation of pressed-out roller hoops, there is a great possibility that these packages can be used on a returnable basis.

Five-gallon tinplate export drums, normally fabricated in 22-gauge material or composite 22/20-gauge material, have now been replaced satisfactorily by Reads with 24-gauge material, incorporating roller hoops, showing a substantial financial saving both in the cost of the drum and in freight.

Good Prospects for Chlorine-Alkali

More Efficient Production and Wider Use Foreseen

CONTINUING growth of the $600 million chlorine-alkali industry, which many experts judged to have been disproportionately expanded during the war, has been predicted by Mr. R. L. Murray, executive vice-president of the Hooker Electrochemical Company, Niagara Falls, New York. He is the 1949 recipient of Jacob A. Schoellkopf Medal of the American Chemical Society's Western New York Station.

Pointing out that virtually all the chlorine manufactured in the United States is made electrolytically by splitting brine into chlorine and alkali, Mr. Murray said that each of 11 outlets calls for more than 100 tons a day of the versatile gas.

Uses of Chlorine

He cited as examples the bleaching of wood pulp for paper, glycol anti-freeze, water purification, anti-knock compounds for motor spirit, and extraction of magnesium metal from sea water. Among the thousands of other products which account for the 5000 tons a day of chlorine produced in the U.S.A., Mr. Murray listed laundry bleach, raw materials for synthetic rubber, DDT and other insecticides, both repellents, synthetic glycerine, chemicals used in making nylon, many plastics, and the poison gas phosgene.

"The value of the basic products made from sodium chloride or potassium chloride brines is estimated to be about $200 million a year," he said. "Including the chemical products derived from caustic soda, chlorine, and hydrogen, it can be conservatively said that the value of these products is averaging well over $600 million a year."

Current estimates forecast that the chlorine output of the U.S.A. will be more than 60 per cent of the world total for 1949, according to Mr. Murray, who added that further expansion must result if the tremendous amount of research now going on in this field is continued, as was certain.

Part of the greatly increased use of chlorine in the past twenty years had been encouraged by the great drop in the price of the gas in the 1920's and early 1930's. Since 1940 the cost of chlorine had advanced only 37 per cent, as compared with 100 per cent for the U.S. commodity price index.

Research had also played a major rôle in reducing the cost of chlorine and in expanding its usefulness. Particularly significant had been the development of many products in which chlorine is used during processing but does not appear in the final product. According to Mr. Murray, this class of chlorine usage accounts for the daily consumption of 1400 tons of the gas.

One outstanding disadvantage of the diaphragm electrolytic cells, from which most of the chlorine and caustic soda in the U.S.A. is obtained, was that the caustic, or alkali, is contaminated with salt and must be purified at relatively heavy expense, Mr. Murray pointed out. Only the purest alkali could be employed in making rayon, one of the major uses for caustic soda.

"Looking into the future," he continued, "It will not be too surprising to see diaphragm cells developed which will allow a higher percentage decomposition of the brine fed into the cell, permitting a much higher percentage of alkali in the cathode liquor, and possibly even rayon-grade caustic soda directly from the cells.

"It is a certainty that cells will be developed having higher and higher amperage ratings. A vertical mercury cell very economical of floor space is a future possibility. Contact or mechanical rectifiers capable of high efficiency even at low voltages, which were in limited use in Germany during the war, are now being made in the U.S.A. and should have a widespread use. The economic recovery of chlorine from by-product hydrochloric acid by an improved and modernised Deacon process is a definite necessity and entirely within the realms of possibility."

INDIAN CHEMICAL IMPORTS

THE Government of India has agreed that the degree of protection of the sodium thiosulphate, sodium sulphite and sodium bisulphite industries was inadequate, and has agreed to raise the duties in accordance with the recommendations of the Tariff Board as follows:—

(1) Sodium sulphite:	
(i) of British manufacture ...	from Rs 8 per cwt. to Rs 23/- per cwt.
(ii) Not of British manufacture	from Rs 12/- per cwt. to Rs 26/- per cwt.
(2) Sodium bisulphite:	
(i) of British manufacture ...	from Rs 8 per cwt. to Rs 19 per cwt.
(ii) not of British manufacture	from Rs 12 per cwt. to Rs 21/8 per cwt.
(3) Sodium thiosulphate:	
(i) of British manufacture ...	from Rs 5 per cwt. to Rs 13/- per cwt.
(ii) not of British manufacture	from Rs 7/8 per cwt. to Rs 15/8 per cwt.

Continuance of protection to the calcium chloride industry for one year (until March 31, 1950), at the present rates of duty as recommended by the Indian Tariff Board has also been accepted by the Government.

Metals Used in Oil Refining

Comparative Resistance to Heat, Stress and Oxidation

by W. I. PUMPHREY, M.Sc., Ph.D.

TO determine the properties required of metals used in refinery construction calls for study of the processes employed in modern oil refining. The crude oil is separated into various constituents by fractional distillation and the individual fractions are themselves finally purified by chemical and distillation methods.

A relatively simple equipment, consisting of a tube still, fractionating column, heat exchangers and condensers, is used for the distillation of the crude oil. The tube heater and fractionating equipment include the following components: (1) heater coils, (2) flue gas recirculation device, (3) a preheater, (4) circulating pumps, (5) heat exchangers, (6) a fractionating column, (7) automatic apparatus for controlling pump speeds, liquid levels and temperature.

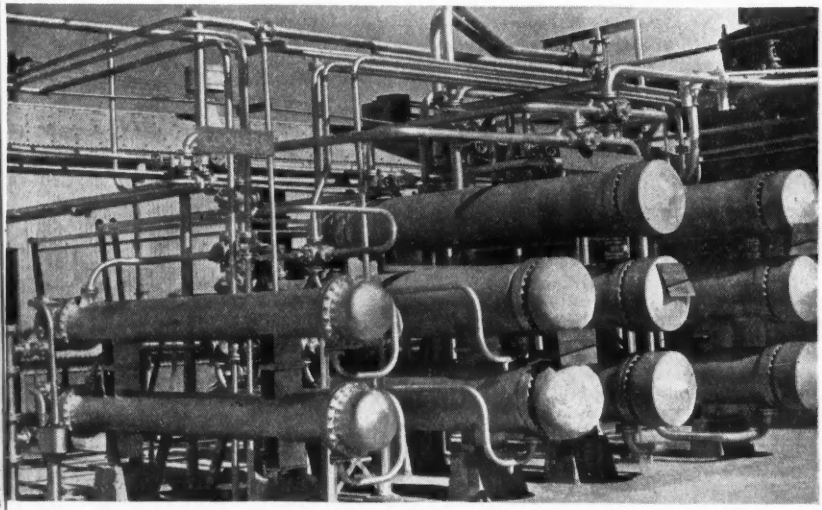
The crude oil is pumped at high velocity through tubes heated by furnace gases, where it is vaporised before passing to the fractionating column. By incorporating in the heating furnaces a set of tubes to absorb radiant heat, and by introducing preheated air to the furnace, greater heating efficiency is obtained.

The recirculation of a proportion of the hot flue gases also assists in maintaining uniformity of temperature in the combustion chamber. The result is that the maximum temperature of the combustion chamber averages 900°C. while the temperature of the gases passing over the tubes is maintained at about 700°C.

The transfer of heat by means of radiation is becoming increasingly used, and in the most recent types of still the efficiency has been greatly increased by exposing practically the entire tube surface to radiation, leaving only a small proportion of energy to be absorbed in the convection section for preheating purposes.

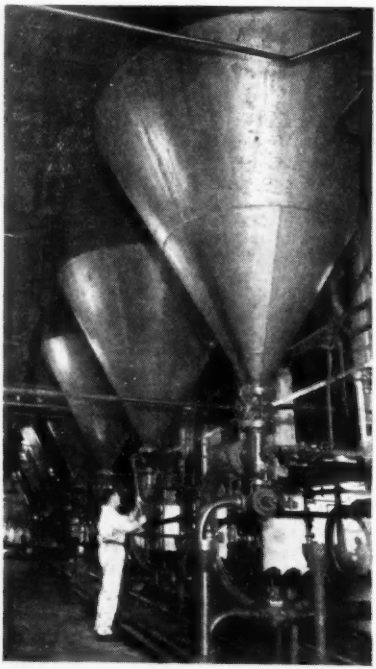
The vaporised oil is separated into its constituent fractions in the fractionating column in the usual way, great attention being paid in the design to obtaining the most intimate contact between the oil vapours and the condensate.

The condensed fractions from the column must be subjected to further refining before they can be put on the market. Condensed heavy oils are vacuum distilled at pressures as low as 5 mm. of mercury and temperatures of the order of 300°C. in



[*Courtesy, Shell Photographic Unit*

Coolers and heat exchangers in Australia's new bitumen refining plant at Clyde, N. S. Wales



[*Courtesy, Shell Photographic Unit*

Agitators at Stanlow refinery at which the oil is brought in contact with fuller's earth and lime, for the production of industrial and special oils

order to separate them into their constituent light and heavy oils for use as lubricants.

Paraffin wax is separated from the higher distillate portion containing it by cooling to about 7°C. and pressing out the heavy associated oil which can be utilised as lubricating oil after re-distillation.

The high boiling point distillates from the crude oil are "cracked" at high temperatures to obtain their constituent low boiling fractions belonging mostly to the aliphatic or paraffin series and of suitable character for use in internal combustion engines.

The "cracking" is carried out by subjecting the oils to a high temperature and pressure in pipe-stills and then passing them into a reactor where the "cracking" takes place, the light fractions being separated from the heavier residues in a rectifying column, a residue of coke being left in the reactor. Cracking can also be carried out in the vapour phase and in some processes various agents are used as catalysts.

Even after redistillation, the separate fractions from the crude oil are more or less contaminated with unsaturated hydrocarbons, sulphur compounds, oxygen and other undesirable bodies.

These are removed and the oil sweetened by treatment with sodium plumbite, by washing with an aqueous alkali hydroxide solution, by treatment with a solvent that dissolves the offending substances or by washing with sulphuric acid. The sulphuric acid refining process is the most popular of the modern "sweetening" methods and consists of agitating the oils with sulphuric acid by mechanical agitators or compressed air in vertical cylindrical steel vessels, and separating the contaminated acid and oil.

After the above chemical cleaning processes the various distillates are finally redistilled if they are required in a very high degree of purity.

Exacting Requirements

Materials for use in an oil refinery must, therefore, in some applications possess good properties at high temperatures, and in others good properties at the low temperatures employed in the dewaxing process. They must be resistant to the corrosive action of the sulphur compounds contained in the oils at both high and low temperatures, and to the mild abrasive conditions caused by the velocity of hot oils and vapours. Scaling, distortion and and growth at elevated temperatures, have to be contended, and, lastly, they must permit of easy fabrication when used in the construction of complicated structures.

Because of these exacting requirements, a great deal of research has gone into the development of suitable materials and the special steels employed in oil refinery construction.

Overcoming Corrosion

During distillation, high temperature wastage from corrosion is caused in the stills chiefly by oxidation of the tube metal on the furnace side and corrosion by sulphur compounds in the circulating oil. This corrosive action can be partly overcome by neutralising the effects of the sulphur compounds with lime, by use of protective coatings (metallic or non-metallic) on the tubes, or by the use of 18/8 stainless steel for the tubes, either in solid drawn form or in the form of a liner to the tubes.

The efficiency of this material is shown by the fact that low carbon 18/8 steel has been used for long periods at still temperatures of up to 650°C. without material corrosion or impairment of its physical pro-

perties.[1] Another possible steel for use in still tubes is 4-6 per cent chromium steel with or without the addition of 0.4 per cent molybdenum.[2,3]

The principal use of this steel, however, is in the manufacture of heat exchange tubes, heat transfer lines, vapour lines, pipes, flanges and other still fittings. Much of the wastage at the ends of still tubes is due to erosion and this can be reduced by rolling ferrules of 18/8 stainless steel into the tube ends after the tubes have been rolled into the headers.[1] For supporting the still tubes in the furnace Nelson[4] reports that mehanite cast iron (0.75—1.4 per cent silicon and 1 per cent manganese of chromium) is now used extensively.

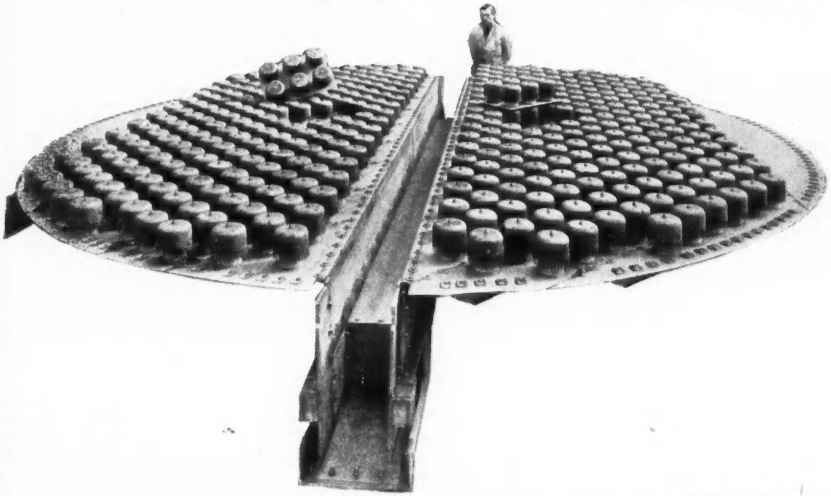
In distillation apparatus hydrochloric acid from the decomposition of calcium and magnesium chlorides in the water is mainly responsible for damage to condensers in the low temperature range. Neutralisation of the acid is beneficial, and cast iron with high nickel and high chromium contents has also been found to give good results in these locations.[5] Irons containing 2.5 per cent nickel are suitable for use at working temperatures up to and above 535°C. and are used in such applications as condenser coils, ammonia pumps and coolers. For resistance to attack and loss of mechanical properties at temperatures of the order of 800°C. an austenitic cast iron containing 14 per cent nickel, 6 per cent copper and 1.5 per cent or more of chromium is said to be very suitable.[6]

Mehanite cast irons are used in the manufacture of bubble caps, trays and baffles in fractionating towers, and this material[4] is said to be resistant to scaling and distortion at high temperatures, resistant to sulphur corrosion, and resistant to the mild abrasive conditions caused by the velocity of hot oils and vapours.

High Strength Required

Low cost steels have recently been developed for use in parts requiring high strength where corrosion and oxidation are not unduly severe, *e.g.*, for exit pipes from condensers. These steels contain a maximum of 0.15 per cent carbon and an average of 0.75 per cent silicon, 1.25-2.5 per cent chromium and 0.5 per cent molybdenum, and are intermediate in price between plain carbon and the 4-6 per cent chromium steels. Steels of this analysis are easily produced in tube form but those steels containing the upper limit of chromium must be welded with care because of their air hardening properties.

In present day cracking furnaces the cracking pressure is at least 1000 p.s.i. and the optimum outlet oil temperature about 570°C. The furnace tubes are, of course, considerably hotter than this, and if the tubes have any internal deposit of coke (which acts as a thermal insulator) their



[Courtesy, Metal Propellers, Ltd.

By the use of alloy steel, the weight of the whole assembly of this bubble tray, for use in an 18ft. 6 in. fractionating tower, is kept down to 5425 lb.

outer surface temperatures can rise as high as 650°C.

A considerable amount (7-13 per cent by volume)[7] of hydrogen sulphide is liberated from oil during the process of cracking, and material for use in cracking furnaces must therefore be able to resist both sulphide attack and corrosion at the high working temperatures used. Methods of overcoming the corrosion problem include building the cracking vessels with thick walls so that they will not be unduly weakened by corrosion, processing the oil to remove harmful impurities, and lining the tubes with refractory paint or ganister linings. The work of Lind[8] indicated that high chromium steels are suitable for cracking furnace tubes.

Suitable Alloy

To overcome the cost problem attendant on the use of high chromium steels, Andrus[9] suggested a method of fabricating a cracking unit in which a carbon steel shell is used for load carrying purposes with an inner lining of stainless steel sheet spot welded to the shell at frequent intervals. The addition of small amounts of silicon and tungsten to austenitic nickel chromium steels (18/8 or 18/14) has also been found[10] to produce an alloy very suitable for use in such locations since it combines a high creep stress value with good resistance to corrosion and scaling.

Dixon[4] has confirmed that steels containing chromium or aluminium are, in general, very suitable for use in cracking units and has suggested the use of the 4-6 per cent chromium alloys for use in such units. These steels have air hardening properties, however, and necessitate very careful welding, and although they are strong, ductile, and tough when heated, it has been observed that the 4-6 per cent chromium steels have a tendency to be brittle in the cold after some two years' operation.

Tubes of this material should therefore always be cleaned hot (above 150°C.) to avoid possible failure if the tubes are cleaned with mechanical knockers.

Less costly alloys than the high chromium steels have also been advocated of late[11] for the fabrication of steamless tubing for cracking furnaces. Crolay 2 and 3M are typical of such alloys and have the following analyses:—

	% C	% Mn	% S	% P	% Si	% Cr	% Mo
Crolay 2	0.115	0.40	0.015	0.015	0.40	1.91	0.51
Crolay 3M.	0.115	0.40	0.015	0.015	0.40	3.03	0.90

Steel of still lower alloy content (0.21 per cent carbon maximum, 0.50—0.90 per cent manganese and 0.4—0.6 per cent molybdenum) has been used recently[12] for construction (by welding) of two cracking reactor chambers, 50 ft. long and 8 ft outside diameter, designed to operate at 500°C. and 350 p.s.i., and to date very little failure has been observed with this steel.

In solvent extraction and dewaxing at 7°C. to −60°C. equipment is usually constructed of 2.25—2.75 per cent nickel steel since this steel permits ease of fabrication and retains in both plate and weld at temperatures of the order of −45°C. a high proportion of the impact value at room temperature.

Nickel cast steels, 2.3—3.5 per cent, are finding application in valve bodies and parts and pump fittings in refinery equipment,[13] and steels containing 0.24—0.35 per cent carbon, 1—1.5 per cent nickel and 0.45 per cent chromium have also been used for the construction of such parts when the working temperature does not exceed 250°C. and the pressure is not greater than 95 atmospheres.[6]

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New Oil Refinery

Fawley May Yield 5 M. Tons Yearly

A PROJECT estimated to cost £3.75 million was begun last week when work started at Fawley, Southampton, on the construction of the Anglo-American Oil Company's new oil refinery, which it is claimed will be the largest in Europe.

The scheme is an important part of the programme outlined in the Government's Economic Survey for 1949 to increase the oil refining capacity of the United Kingdom, the most promising means of saving dollars.

The plant will take about three years to complete. It will manufacture petrol, kerosene, gas and diesel oils, heavy residual fuel oils, asphalts and smaller quantities of special products.

Output is expected to reach over 5 million tons a year, compared with present production of 800,000 tons. The site of the new refinery covers some 970 acres and about 2500 people will eventually be employed, instead of the present 900.

ALKANE SULPHONIC ACIDS

New Industrial Uses Indicated in the U.S.A.

As a result of research work carried out by the Standard Oil Company (Indiana), mixed alkane sulphonic acid, consisting of methane sulphonic acid, ethane sulphonic acid and propane sulphonic acids, became available in commercial quantities towards the end of 1948. Later developments enabled limited quantites of methane sulphonic acid and ethane sulphonic acid to be made for research and evaluation work.

These acids differ markedly from the conventional sulphonic acids produced from petroleum sources, the molecular weight, properties and uses of the alkane sulphonic acids being quite different.

As a class, the alkane sulphuric acids are resistant to chemical attack, being resistant to oxidation by concentrated nitric acid, and are unaffected by boiling water even on prolonged treatment. The salts of the alkane sulphonic acid are not hydrolysed in hot alkaline solutions. Free chlorine is without action in methane sulphonic acid and ethane sulphonic acid.

Solubility

Alkane sulphonic acids have a *p*H varying from 1.05 to 1.15 (1 per cent solution). They mix completely with water, alcohol and oleic acid. Other solvents, such as benzene and toluene, are able to dissolve small quantities of the acids, but they are soluble only to a very small extent in hexane.

The boiling points and specific gravity of the pure acids are as follows:—

	B.P. °C.	mm.	*Sp. Gr.* 25°/4°C.
CH_3SO_3H	122	1.0	1.4844
$CH_3CH_2SO_3H$	123	1.0	1.3341
$CH_3CH_2CH_2SO_3H$	136	1.0	1.2516
$CH_3CH_2CH_2CH_2SO_3H$	147	0.5	1.1906

As catalysts in polymerisation processes, alkylation, esterification, etherification, dehydration, etc., the alkane sulphonic acids show considerable promise. In polymerisation, the action of the acids is milder than that of concentrated sulphuric acid and generally more selective.

By use of alkane sulphonic acids in olefin polymerisation hydrogen transfer reactions are minimised. In the alkylation of aromatics of phenols with certain olefins to produce alkyl aromatics, alkyl phenols, etc., it is noticeable that lighter coloured products are obtained. Of considerable importance is the fact that, owing to their non-oxidising and non-sulphonating properties, the alkane sulphonic acids are particularly useful catalysts for the preparation of alkyl phenols.

Esterification and ester exchange reactions, involving mono- and dicarboxylic acids and mono-, di- and polyhydric alcohols, can profit from the use of these acids as they enable high esterification rates to be secured; they also ensure high yields and there is less of a tendency for the reactions to produce objectionable colour bodies.

Effective Catalysts

For etherification, the alkane sulphonic acids have been found very effective catalysts. Ethers and thioethers can be made by reacting alcohols or mercaptans with olefins using alkane sulphonic acids.

In modern dehydration processes the use of alkane sulphonic acids has been found effective in the treatment of castor oil, 1 per cent of the catalyst, when employed at a temperature of 240°C. under vacuum, giving a much lighter coloured oil than it is possible to obtain by use of sulphuric acid.

Electrochemical studies indicate that the alkane sulphonic acids are of appreciable potential value in electrotyping, electroforming, electrowinning and electrorefining of several metals. It is reported by the Standard Oil Company that the rapid deposition of heavy ductile copper plates, takes place from mixed alkane-sulphonic acid baths.

Moreover, indications are that good deposits of zinc, cadmium, tin, lead, iron, nickel and silver can also be obtained.

The copper bath may be operated with current densities as high as 500 to 800 amperes/sq. ft., with moderate agitation. The deposit is fine grained and ductile and adherence to the base metal is generally good. It is claimed that the stability of the anion to hydrolysis allows the use of the bath over long periods.

Separation of Aromatics

Preliminary tests have shown that the alkane sulphonic acids are likely to be useful as solvents; for example, NO_2 can be selectively absorbed in the acids, and subsequently removed by heating. Other applications where the acids can play a selective rôle are in the separation of aromatics from paraffins, thiophene from benzene, olefins from aromatics, propylene from ethylene, non-primary olefins from

acetylene, recovery of nitrogen bases and the separation of nitrogen bases from organic media.

The acids also act as solvent media for carrying out various chemical reactions, such as nitration, chlorination and oxidation.

Heavy metal salts of the alkane sulphonic acids are suggested for deep penetration into textiles, leather, etc., for subsequent precipitation of insoluble heavy metal salts or dyes by double decomposition. Some metallic salts of alkane sulphonic acids are useful in air conditioning and low vacua, and the heavy metal salts have been tried out as weighting and finishing agents in the textile industry.

Magnesium oxyalkane sulphonic cements are claimed to be similar to the oxychloride cements. Alkane sulphonic acids and mixtures of these acids with hydrochloric acid have been tried out successfully in well treating, cementing and sealing.

The alkane sulphonic acids, their heavy metal salts, esters and ammonium salts, offer some promise as insecticides, fungicides, herbicides, bactericides and rodenticides. The aluminium salts of these acids are also suggested as anti-perspirants for the treatment of various textiles.

One important advantage in using the alkane sulphonic acids as catalysts, solvents, etc., is that they may be easily recovered for future use. Reconcentration of the acid phase from washing and dilutions can be accomplished in several ways. Vacuum evaporation, gas stripping, or an aziotroping agent are required to obtain low water content in the recovered acid. Acid strengths as high as 93 per cent have been obtained by air blowing.

Lignin as Plastics Raw Material

Substantial Progress in Italian Research

SOME recent Italian research with lignin as raw material for plastics was reported in THE CHEMICAL AGE, recently (*60*, 420). This may now be supplemented by a record of work at Padua University by Prof. I. Sorgato, who, during the past ten years, has been closely occupied with this section of the plastics field. Although much has been published on the subject, there are apparently only two factories in Europe manufacturing lignin plastics, and these are both situated in Venice, and are developing on an industrial scale methods evolved at the University with the aid of the CNR (Consiglio Naz. delle Richerche).[1,2,3,4,5]

Methods of Production

Some account was given by Meneghini and Sorgato in 1943[1] of a semi-industrial process which has since been worked on a larger scale. It is well known that in Germany attempts have been made to use lignin obtained from wood saccharification, but without much success; and in Russia and America lignin from the partial hydrolysis of wood has been used.

The products obtained by the latter method were, however, not comparable with the pheno-plastic resins, in the opinion of Prof. Sorgato (*Chim. et Ind.*, 1949, *61*, 345-8). Recovery of the lignin from ligno-sulphonic acid is tedious and troublesome; and in Italy preference has been given to alkali-lignin as raw material from which products have been obtained equal in quality, it is claimed, to the phenoplastics.[6,7,8,9]

It is true that in the U.S.A. the Meadol Corporation[10] has studied the properties of these alkali-lignins, but the resulting products still contain a large proportion of phenol, up to about half of that contained in the corresponding phenolic powders, as compared with only about 2-3 per cent contained in the Italian ligno-plastics.

The properties of the plastics depend, of course, largely on those of the lignin. In preparing the latter it is not necessary to reduce the reactivity and degree of colloidal dispersion; the number of phenolic hydroxyls should be as large and that of aliphatic hydroxyls as small as possible, with maximum depolymerisation.

The cycle of operations is therefore as follows: precipitation with a special agent such as chlorinated and partially hydrolysed sawdust; cold filtering of the gelled mass obtained; washing with very dilute HCl and with water; dehydrating which includes also partial removal of salts and the reduction of ash content to 0.5—1 per cent; and finally fluidising to obtain maximum dispersion and reactivity.

Sources of Supply

Physical factors, such as humidity, dispersion, temperature, of course, play a very important part; but despite careful control of these there are marked yet inexplicable differences in samples from the same batch of lignin. Fir wood or deal was mostly

used, but other sources—wheat- or hemp-straw—have given good results.

The chemical changes in lignin, under the action of suitable temperature and pressure, consist in the partial elimination of aliphatic hydroxyls, and in the formation of hydroxyls of the phenolic type, due to condensations and decompositions, *e.g.*, of dioxy-methylenic groups. These, as indicated, are desirable changes; they reduce the number of carbinols and consequently the water absorption, and at the same time increase the reactivity with condensing agents.

By itself, lignin, therefore, can only act as a binder, as in the manufacture of laminates, of which an example is given by the author. The characteristics of the products are claimed to be equal to those of phenoplastic laminates.

In order to impart thermo-setting or hardening properties to the lignin it has generally been considered necessary to react with phenol and formaldehyde; but Sorgato holds the view that it is only the pheno-alcohols with some free bonds, and especially free formaldehyde, that can induce resinification of the lignin and formation of methylenic linkages.

Phenol — Lignin

In this connection various polymerisations in natural products are cited by way of example. Formation of phenol-lignin has been explained as resulting from the reaction of active carboxylic groups—formed by elimination of water—under an enolic form with phenols. The phenolic hydroxyl remains free and if, during subsequent processing, further phenolic hydroxyls are freed, they will no doubt activate the addition of formaldehyde and form methylenic bridges (linkages).

In the Italian work it has been preferred to utilise aldehydes rather than phenols. Acetaldehyde has long been used, but this acts as a plasticiser rather than thermo-hardening agent.

The nature of the reactions between lignin and formaldehyde are still imperfectly known. It was first reacted with lignin in solution as soda-lignin without excess of NaOH, over the reflex water-bath, precipitated with acid and thoroughly washed.

Resistant Properties

In milling, the formo-lignin rapidly hardened into a very resistant product. The resin, when mixed with powdered wood and other materials, showed low quality "slip," high water absorption, and very low di-electric stability. If caustic soda is replaced with ammonia the precipitate is much softer and the product more suitable for use in production of laminates.

As a colloidal suspension, the lignin may be treated with formaldehyde in an autoclave under low pressure. The formo-lignin is collected as a friable mass of somewhat soft consistency and variable quality. The formaldehyde in excess is recoverable.

As a plasticiser during the hot processing a suitable resin, 22-3 per cent, must be added. One advantage claimed for this method of procedure is that the need for drying the lignin is eliminated, since the mixture of resin and wood powder can be calendered with a high degree of humidity, up to 20-25 per cent. The final products contain about 40 per cent of lignin, and, compared with the pheno-plastics, they mould about equally well but are inferior in regard to slip, come easily from the mould, have fairly uniform lustre, are mechanically resistant, but have higher water absorption and lower di-electric stability.

Mould Materials

The last characteristic may be improved by keeping the powders at 60° C. for some hours. It is well to have the moulds of chrome- or stainless-steel.

Furfural is a valuable polymerising agent, and its properties in this respect and especially for phenolic hydroxyls, are well known. Sorgato has already reported that it can be used in the acetal form for secondary or tertiary alcohols.[11] It has a high molecular weight; it is both a solvent and plasticiser for the resin; and acts as hardening agent for the resin already formed. Resinification takes place in the mixer; the lignin, dehydrated and fluidised, is converted into resin, setting free about 40 per cent of total water, together with some of the salts.

The author concludes with some notes on the relative properties of the formo-lignic and formo-phenolic resins.

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Misuse of Gas Cylinders

American Observations on Some Typical Accident Causes*

IT is rarely the well-informed individual who works with compressed gas every day who gets into trouble. It is more often the person who occasionally uses a cylinder of these gases who endangers his life. The Compressed Gas Association (of New York) has drafted rules for safe handling of compressed gases and a pamphlet including these rules is available. If everyone were familiar with and abided by these rules there would be far fewer accidents involving compressed gas.

Would you try to pour more liquid into a glass bottle than you knew it could hold? Of course not! But several times a year we learn that someone has overfilled a cylinder with a compressed gas. Rising temperatures and lack of pressure relief devices rupture the cylinder. Fragments from bursting cylinders are like steel projectiles.

Bursting Pressure

The workman in the chemical plant who held a steam hose to a full ammonia cylinder to build up enough pressure to empty its charge rapidly, did not appreciate how rapidly it would empty. At the greatly elevated temperature, the cylinder became liquid-full due to expansion. Hydrostatic pressure finally ruptured the cylinder because the bursting pressure of the cylinder was exceeded. Pieces of that man's body were scraped from the roof girders. That sounds like a crude way to state the case, but it actually happened.

Another variation of the same accident took place just a few years ago in a refrigeration manufacturing plant when a cylinder became liquid-full with no one in the vicinity. This 1500-lb. steel cylinder containing one ton of "Freon-12" refrigerant was inadvertently heated beyond its recommended limit for safe operation. The overheating was caused by mechanical rather than human failure when the heat control failed during the night.

When the cylinder burst, ¾ ton of steel went crashing through the roof and wrecked the main transformer for the entire plant. It was more than two days before that large plant resumed operations.

These two cases illustrate the result of too much heat on gas cylinders, but too much cold may be almost as bad. How many times in the laboratory has someone cooled a small cylinder of undetermined material of construction to a very low temperature in order to charge it with a low boiling liquid, without realising that in the region of −100°F. some metals become fragile or develop tremendous strains?

When such cylinders again reach room temperatures, the internal pressures developed may be sufficient to cause rupture. And don't forget—if it is aimed right, a small cylinder can cause as much injury, death, and property damage as a large one.

Hydrogen "Rocket"

Not many years ago, in a chemical company's research laboratory, someone was in too much of a hurry to fasten a large hydrogen cylinder to the wall with a restraining chain. For some unknown reason the cylinder lost its balance—after all they are *all* top heavy—and fell to the floor. As it fell, the valve at the top struck another object and was sheared off. Thus, a rocket was born.

The cylinder took off, charged through two inside partitions, blasted through the brick outer wall, and finally landed out in the yard several hundred feet from its starting point. Luckily, no one was in its path.

This accident would not have occurred if the chain had been fastened or a supporting stand provided. As a result, this company barred this size cylinder from the laboratory and now either pipes the gases into the building from outside or uses smaller cylinders. Next time, it might not be so lucky.

Cylinder Labels

One of the principal causes of accidents involves misreading or neglecting to read the labels on gas cylinders. Years ago many patients in hospitals were subject to acetylene or other gases instead of oxygen because of mistaking the proper cylinder. That accident does not occur any more because the cylinder fittings have been made different now just so that performance cannot be repeated. At the same time we must guard against use of adapters so that these safety-conscious efforts of the gas manufacturers will not be thwarted.

The safe handling and use of cylinders has been made easy. Although millions of cylinders are in circulation, they are not dangerous when properly handled. Those last three words "when properly handled" mean the difference between safe handling and serious accidents.

* Abstracted from an article by Edmond G. Young (Kinetic Chemicals, Inc.) *The Journal of Chemical Education* (U.S.A.), 1949, 5, 258-9.

U.S. STUDY OF GAS LOSSES

Original Treatment of an Electronic Tube Problem

(From Our New York Correspondent)

THE problem of gas disappearance from electronic tubes filled with a noble gas such as argon, neon, or helium, widely used in many kinds of electronic equipment, is of considerable and growing importance. Since gas density is independent of temperature, gas tubes have a distinct advantage over those filled with a metallic vapour, the electrical characteristics of which change with the thermal variations in vapour density. On the other hand, the life of gas-filled tubes is limited by a gradual reduction in gas pressure with use.

This tendency is generally thought to result from the bombardment of negatively charged electrodes by high-velocity positive gas ions that penetrate the metal surfaces and become permanently trapped. Past studies of gas absorption in electrical discharges are difficult to apply because of wide variations in experimental conditions.

Looking for some of the answers, the Electron Tube Laboratory of the U.S. National Bureau of Standards has been carrying on a study of the phenomena in a specially-designed discharge tube with a replaceable tantalum probe wire to collect the positive ions. During operation, the rate of gas reduction is measured for various d.c. potentials on the probe in the presence of an arc discharge. In addition to the probe wire, this helium-filled discharge tube employs an oxide-coated cathode and a nickel anode.

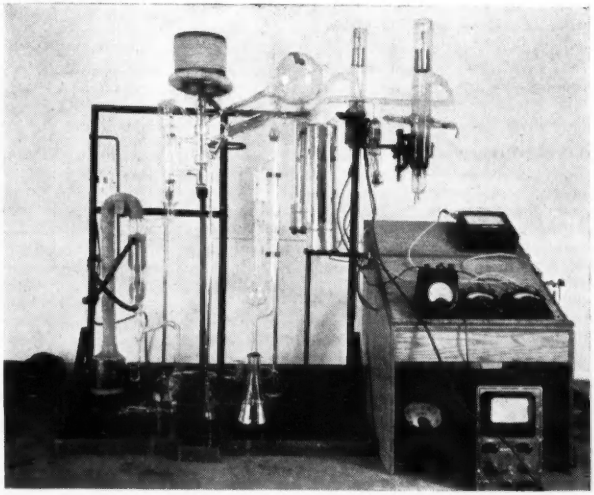
All gas disappearance other than "clean-up" into the negative probe is designated as "self" clean-up. It is reasonable to expect that this gas loss is caused by escape into the other electrodes and into sputtered deposits or leakage through the tube wall.

The diffusion of helium through hard glass envelopes has been checked and found to be negligible at the usual operating temperatures and pressures. Since the anode in the discharge tube is maintained at a higher positive potential than any other element, positive gas ions will not be attracted to the anode and loss there is not to be expected. On the other hand, the cathode probably accounts for the major part of "self clean-up" in arc-discharge tubes.

Since the latter cannot be avoided completely, its value is determined experimentally by operating the discharge tube with a positive probe voltage so that electrons rather than positive ions are drawn to the probe. To avoid overheating the probe wire, negative voltage is repeatedly applied in pulses of several milliseconds' duration.

A necessary condition for reproducible results is that the filler gases be of uni-

(Continued at foot of next page)



In the experimental investigation of helium disappearance by tantalum in an arc discharge, this apparatus is used. The vacuum system includes a mercury diffusion lamp, a gas purifying tube, fritted glass valve, mercury cut-offs, liquid-air trap and ionisation gauge. The two arc discharge tubes appear at the upper right

Manufacture of Chlorine Dioxide

Economy and Safety Claimed for New Methods

THE increased importance of chlorine dioxide in recent years, in its capacity as an energetic oxidising agent, lends interest to two new methods of production, which are the subject of patents just open to public inspection. The first of these, English patent No. 22820/1948, Conv. date 21.10.47, is in the name of the Mathieson Chemical Corporation.

It is pointed out that in the English patent No. 595,813 (date 12.7.44), a process for production of the dioxide was described in which nitrogen peroxide is caused to react with an alkali or alkaline earth metal chlorite, *e.g.*, sodium chlorite in flake or granular form. The peroxide is preferably mixed with an inert gas such as air while in contact with the chlorite, whereby ClO_2, free from chlorine and in safe concentration, may be chemically produced.

The present invention is an improvement on this method. A cyclic process is claimed whereby NO_2 is recovered from residual salts and repeatedly used; and only a small amount of make-up peroxide is required to be added from time to time. The peroxide is recovered by reacting an acid with the nitrite, thus generating a nitrous gas mixture of NO and NO_2 in about equal molar proportions. Air is simultaneously or subsequently admitted, and the chemical reactions involved appear to be:

1. $NO_2 + NaClO_2 \rightarrow ClO_2 + NaNO_2$
2. $NaNO_2 + H_2SO_4 \rightarrow HNO_2 + NaHSO_4$
3. $HNO_2 \rightarrow \frac{1}{2}H_2O + \frac{1}{2}NO + \frac{1}{2}NO_2$
4. $\frac{1}{2}NO + \frac{1}{4}O_2 \rightarrow \frac{1}{2}NO_2$

Air or other cheap source of oxygen is adequate; and other non-volatile acid, such as phosphoric or nitric, may be used instead of sulphuric. Suitable plant is described.

The other patent, No. 26649/1948, Conv. date 20.10.47, is in the name of Wallace & Tiernan, Co., Inc.

Chlorine dioxide, as usually produced, in the form of gas is highly explosive. For convenience and safety, it is usually generated only when it is required, and for further safety is mixed with an inert gas.

It is known that it can be produced from potassium chlorate and sulphuric acid, or by treating sodium chlorate with chlorine gas, but these methods are inconvenient.

It has now been found that ClO_2 may be produced by reacting nitrogen trichloride with sodium nitrite, yielding the dioxide and sodium chloride, as well as some sodium hydroxide and ammonia. If the reaction is carried out in the presence of a substantial amount of water, the following is probably the reaction:

$$NCl_3 + 3H_2O + 6NaClO_2 \rightarrow 6ClO_2 + 3NaCl + 3NaOH + 3NH_3$$

The ammonia formed may provide an additional suitable diluent for the chlorine dioxide. The sodium hydroxide also formed should not be allowed to accumulate to any substantial concentration, otherwise the reaction is reversed. Such accumulation may be avoided by keeping the sodium chlorite practically dry, and passing the NCl_3 in gaseous form in contact with it.

Although this requires twice as much of trichloride the dry method is believed to be much easier to control, and simpler in practice. The trichloride may be prepared by reacting chlorine with ammonium chloride. In any case it must be diluted.

U.S. STUDY OF GAS LOSSES

(Continued from previous page)

formly high purity. Barometrically operated mercury cut-offs have been employed in the vacuum system, and contamination from stopcock vapours or leakage is avoided by introducing the gas through a pair of fritted glass discs, which can be completely covered with mercury to interrupt the gas flow. Before a noble gas is admitted to the discharge tube, the small amounts of impurities which may exist in the unopened flask are eliminated by passing the gas over hot zirconium and tantalum wires.

With a known tube volume, the total number of ions trapped during a test run may be computed from the observed drop in pressure, while the number of ions striking the probe can be found directly from the observation of the probe current.

Care was taken to ensure that the thickness of the ion sheath around the probe wire was considerably smaller than the mean free path of the gas ions, so that the ion energy could be determined from the probe potential.

Further problems under study include the complete recovery of trapped gas, a determination of the amount of gas which can be absorbed by the probe before saturation occurs, and a correction of the probe current for electron emission. Now that satisfactory techniques have been developed for a particular probe material and filler gas, these methods can be extended to other solids and noble gases used in tubes.

DETECTING CARBON MONOXIDE

Simplified Methods of Estimation

"GASSING accidents caused by inhalation of carbon monoxide, many of which are fatal, still occur far too frequently in industrial premises." This statement, from a recent Ministry of Labour pamphlet (Form 827) encourages the belief that a simple works method of determining traces of CO in air is needed.

Most of the older methods depended on the use of palladium salts, which are reduced with the production of a black or brown stain when a paper impregnated with the solution is exposed to the sample of air in which CO is present.

During the war, a great improvement on this method was made when a glass tube containing silica gel impregnated with a double palladium sulphite was introduced. This could be sealed up at both ends and kept until required. On breaking the seal and passing the air sample through at a specified rate for two minutes a dark brown ring was produced if CO was present. The length of this stain in millimetres, was found to give a reliable indication of the amount of the gas present.

In a further development, plain white silica gel was filled on both sides of the sensitised material; this served as a filter for interfering organic compounds, and also ensured that the humidity of the sample was at a pre-determined value when it entered the palladised portion (the silica gel contains 10 per cent of water). The double filling makes it possible to carry out two tests on each tube, and Fig. 1 shows the appearance presented after two such estimations. The 6 mm. stain corresponds (on this batch of tubes) to 0.023 per cent CO.

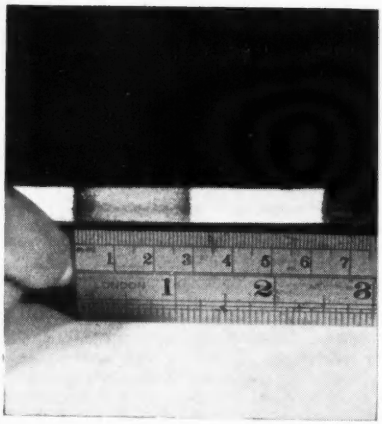


Fig. 1

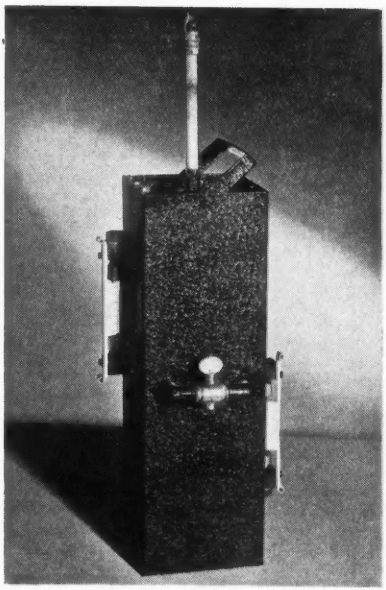


Fig. 2

Evidently, it is important that the sample should be pulled through the tube at the same rate as that at which the batch has been calibrated; and a device (Fig. 2) has lately been developed for this purpose—the principles of which have been described earlier (THE CHEMICAL AGE, 1947, *57*, 799). It is an aspirator, pre-set to a constant rate of flow, which never needs refilling, for the water flows into a lower compartment identical with the upper. When the upper compartment is empty, after three tests have been made, all that is necessary is to invert the apparatus so that the chamber containing water is on top.

The scale at the side of each compartment is calibrated directly in minutes to make the use of the apparatus simpler for the semi-skilled operator. For guidance, on the containers are tabulated the CO concentrations in relation to the length of stain measured after a two-minute test.

A CHEMIST'S BOOKSHELF

Crystals and X-Rays. Kathleen Lonsdale, D.Sc., F.R.S. 1949. Bell. pp. 199, plates 13, 21s.

"This book is designed to show industrial administrative and technical staffs the possibilities of X-ray crystallographic methods and to instruct those who do use them, but without understanding, the tool that has been put into their hands." This extract from the publisher's notice, and based on the foreword, expresses a high ideal to which this book fails to attain. The book, we are told, is based on a course of public lectures, and one can only hope that many of the points dealing, for example, with crystal geometry, the various types of crystal projection, the symmetry classes and the concept of space group and its symbolism (p. 70) were more adequately explained on those occasions by black-board and chalk, than they are in print. Reading a book which deals with a scientific subject, one expects to encounter some small measure of difficulty, but on re-reading, this usually resolves itself; in this case there are difficulties in plenty, and further reading does not dispell them. Certainly industrial administrative staffs could be forgiven if they failed to appreciate the precision and compactness (p. 54) of the expression for crystal spacing "which is easy to remember because of its symmetry." Dr. Lonsdale may have overestimated the intelligence of her public.

The feeling cannot be avoided that too much has been condensed into a book of small compass; and one is reminded of a candidate's examination notes—so highly condensed as to be obscure to anyone but the writer. That effect is heightened by the extensive use of chemical symbols. Such abbreviations could have been avoided without adding substantially to the printing costs. Drastic pruning would have shorn the work of some whimsicalities, such as this in the description of crystal drawing and projection: "Such drawings are also made as if the eye were looking down from a little above and slightly to the right, like a benevolent Conservative government." The only leaven a scientific book should require is clarity of exposition and purpose.

Rubber in Chemical Engineering. 2nd edition. H. P. Stevens and M. B. Donald. London: The British Rubber Development Board. Pp. 82.

First issued in 1933, reprinted in 1939, this book has received a very thorough revision involving the rewriting of much of the text, so that it sets out the present position of rubber as applied to the chemical and allied industries. Opportunity has been taken to replace a number of the old pictures with more modern illustrations and the considerable technical advances which have taken place during the past decade have been incorporated in the text. Natural rubber is, of course, the material of choice, but, to ensure completeness, reference has been made, where necessary, to the virtues possessed by synthetic rubbers.

The book is in five chapters, the first dealing with the properties of rubber—raw, soft and hard, with vulcanite or ebonite, tables giving their resistance to acids and alkalis, their mechanical and physical properties, etc. Chapter 2 deals with linings of rubber sheeting, giving the present practice in methods of application, including testing and design. The question of bonding is dealt with in detail and a section of this chapter is devoted to non-metals such as rubberised cements. Thermosetting and thermolastic adhesives, including Factice and a number of alternative methods are also outlined. The chemical resistance of rubber is covered in Chapter 3 and long, detailed and important tables give the resistance of hard and soft rubbers to very wide variety of chemicals—inorganic acids, inorganic salts and alkalis, organic materials, etc. These tables alone render the book valuable to all chemical engineers. There is a useful bibliography of 100 references. Chapter 4 describes rubber paints, cements and varnishes, using oxidised, sulphonated and chlorinated rubbers. Rubber hydrochloride, and latex are also included. Specific uses of rubber in chemical engineering are described in Chapter 5—pipes, valves, plugs, chutes, conveyors, pumps, centrifugals, evaporators, etc., are all informatively reviewed.

Technical Publications

MERCURY-in-steel distance thermometers are regarded as superior in accuracy and reliability to other types such as ether vapour, methyl chloride, mercury vapour and alcohol or gas expansion instruments. In their latest catalogue (No. T/40), Negretti and Zambra list the sources of error common to distance thermometers and show the advantages of the mercury-in-steel type. Dial thermometers and temperature recorders are amply illustrated and tables of their weights and dimensions given, also a useful list of accessories.

* * *

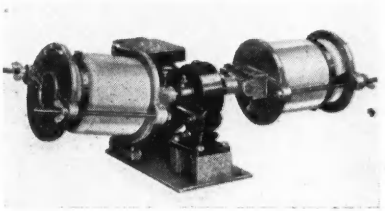
The growing demand for aluminium wire and increasing applications of it led to the combination of the British Aluminium Co., Ltd., Tube Investments, Ltd., and the Hawker Siddeley Group, Ltd., into one company The Aluminium Wire and Cable Co., Ltd. Its aim is to operate an up-to-date factory, to centralise technical and research facilities and to co-ordinate work on new materials and applications. A modern works at Port Tennant, Swansea, has been acquired. A well-illustrated brochure giving useful tables of the properties of AWCO products has just been issued by the new company.

* * *

Some useful technical background for determining the best means of dealing with problems of eliminating dusts and other fine particles is contained in the latest booklet (reference D.R.349) just issued by the Power-Gas Corporation, Ltd., Stockton-on-Tees. Probably of widest interest is the P-G-Dracco equipment, supplied in three main types—fully automatic, semi-automatic, and non-automatic, the capacity range being 200 c.f.m.—100,000 c.f.m. The brochure contains photographs illustrating installations in chemical, crushing, grinding, enamelling, food-processing and screening plants, smelting works, foundries and feed mills; interesting design data; and useful volume and resistance tables.

* * *

A sensible compromise to alleviate some of the stringency in laboratory glassware supplies has been adopted by Quickfit & Quartz, Ltd. This is referred to in their new illustrated catalogue "Interchangeable Laboratory Glassware." While extending the range of its products, the firm has not lost sight of its original idea to concentrate on a minimum number of pieces and sizes to make possible mass production of items which would otherwise have been available to few. Certain components which are kept in stock have accordingly been indicated in heavy type throughout the catalogue. A new factory at Stone, Staffordshire, now in production, is expected to reduce delay in execution of orders.



Grinding and mixing on the laboratory scale is greatly facilitated by this small instrument (12 in. high) which is an efficient ball mill and, without the ball charge, mixes 500 grammes or 0.75 litre of liquid in each of the jars, both of which can be set to rotate eccentrically (The Pascall Engineering Co., Ltd.)

* * *

A useful commentary on the new British Pharmacopœia, published last September, has been issued by The Pharmaceutical Press (5s. 9d. post paid). This is a reprint of the series of lectures given by members of the British Pharmacopœia Commission with some relevant material added, and should be of value to students and pharmacists who attended the course, and a guide to those who were unable to do so.

* * *

Chemical apparatus that is available ex-stock without any delay in delivery is listed in the new catalogue published by Vicsons, Ltd., Harrow, Middlesex. There is an index to facilitate finding of any particular product.

* * *

Information of value to the practical foundryman is the object of "Foundry Practice" published by Foseco Foundry Services, Ltd., Birmingham. In the current issue (No. 95) the series of articles on gravity diecasting is continued with No. 10, "How to Design Simple Moulds"; iron founding (chapter 3), and some helpful practical advice. Under the heading "Technical Service Department Goes to Press" an investigation was made on the polished surface of nickel castings marred by sand and gas inclusions.

(*Continued Overleaf*)

A useful work of reference on solvents, plasticisers, and metallic soaps is the new catalogue now obtainable from A. Boake, Roberts & Co., Ltd. This is a companion volume to that on fine chemicals published last year, and a section on resins is now being planned. As previously, specifications are given for each item in the left hand column, while a short monograph to suggest possible uses, etc., is shown on the right. The pages are bound in loose-leaf form so that the latest information can be added as it becomes available.

* * *

Interesting details about the problems of transporting corrosive or explosive materials are contained in the May number of *The Leyland Journal* issued by Leyland Motors, Ltd., Lancashire. A new Zealand correspondent describes how many difficulties were overcome to permit a daily service of transport of sulphuric acid by road. The contrast between war-time operations and those under which explosives are handled in civilian life is reflected in an article dealing with the special vans which have been delivered to Imperial Chemical Industries, Ltd.

A new list of products available from Evans Medical Supplies, Ltd., London and Liverpool, has just been issued in booklet form. A therapeutic index precedes the main section, which is arranged alphabetically with cross references to the vitamin section, and the section describing antitoxins, tuberculins, serological products and vaccine.

* * *

Copies of Nuovo Repertorio Della Produzione Chimica Italiana, 1948, a comprehensive survey of the heavy and fine chemical industry in Italy and of their manufacturers, may be obtained by direct application to Dr. M. A. Phillips, 117 South Street, Romford, Essex

* * *

The story behind the discovery of Vitamin B_{12}, an important anti-anæmia factor, is the subject of a handsomely produced brochure published by Evans Medical Supplies, Ltd., Liverpool. Particulars are also given of neo-hepatex, a non-toxic highly practionated proteolysed liver extract for intramuscular or intravenous use.

Successful U.S. Tests of Grain Alcohol Motor Fuel

ON two recent journeys of nearly 1000 miles each, a U.S. Department of Agriculture test truck ran successfully on relatively inexpensive low-octane petroleum fortified by periodic injections of alcohol and water. Results of these long-distance road trials, according to the department's Bureau of Agricultural and Industrial Chemistry, show how using alcohol in motor vehicles can help to conserve petroleum and provide a potentially vast new market for surplus grains.

In the first trial the truck operated as well on 58-octane petroleum plus alcohol-water injection as it would on regular petroleum, which has an octane rating of 74 or better. The alcohol-water mixture (85 per cent alcohol, 15 per cent water) was injected automatically into the truck's carburettor when the engine was under heavy load, as in climbing hills, accelerating in traffic, or passing other vehicles. This enabled the engine to give knock-free performance even with the low-octane petroleum.

For the second trial run the engine was equipped with a high-compression head (8.25 to 1 compression ratio). This made it necessary to supply the engine with fuel having an effective octane rating of at least 85. On this trip 74-octane petroleum plus alcohol-water injection was used satisfactorily.

The real saving in fuel, as indicated in the tests, is shown by the fact that every gallon of alcohol and water used permitted the truck's engine to burn 12 gallons of low-grade petroleum (58 octane) in place of 12 or more gallons of ordinary petroleum (74 octane).

Alcohol-water injection was used extensively by the Air Forces during the war to give planes a temporary boost in power, and it is still used to provide added impetus for take-off. In motor cars, trucks, and tractors, however, it can make possible knock-free engine performance with relatively low-octane fuel. During at least 80 per cent of normal driving, when a car is running on the level at speeds up to about 40 m.p.h., the engine will operate satisfactorily on petroleum fuel of 50 octane number or even lower. Since ordinary motor fuel is 74 octane or better, much of its anti-knock quality is in effect wasted.

With alcohol-water injection, the octane requirements of high compression engines towards which there is a current trend, can be satisfied with the ordinary motor car petroleum fuels available to-day.

Personal

AT the annual meetings of the International Superphosphate Manufacturers' Association, held in Copenhagen recently, MR. A. WALLER (Holland) announced his retirement from the presidency, and was unanimously elected honorary president. For the year 1949/50, the following officers were elected or re-elected:—President, MR. R. STANDAERT (Belgium); vice-presidents: MR. R. AUDOUIN (France), MR. B. COLBJORNSEN (Sweden), MR. F. G. CLAVERING FISON (U.K.), MR. H. STEVENIUS-NIELSON (Denmark), MR. J. D. WALLER (Holland); secretary, MR. R. M. COLLINS.

MR. J. H. COOPER, who has for many years been in charge of the northern sales areas for the chemical products, including sodium and potassium silicates, caustic soda, etc., of Joseph Crosfield & Sons, Ltd., Warrington, retired at the end of May after more than 43 years' service in that department. His colleagues of both the inside and outside staffs made a presentation to him at a farewell dinner. He is succeeded in the position by MR. S. YATES-DUTTON, who has been for some years assistant chemical sales manager.

The Pharmaceutical Society of Great Britain will be represented at the Assembly of the International Pharmaceutical Federation in Amsterdam from August 29 to September 2 by the president, MR. H. CLEMENT SHAW; MR. E. A. BROCKLEHURST, Hull; MISS M. A. BURR, Nottingham; MR. J. F. MCNEAL, Watford; MR. F. W. ADAMS, secretary and registrar; PROF. BRINDLE, PROF. TODD, and DR. J. M. ROWSON, who will present a paper.

MR. H. CLEMENT SHAW, chairman and managing director of T. C. Cornwell, Ltd., which owns a group of pharmacies in North Staffordshire, has been re-elected president of the Pharmaceutical Society of Great Britain for the ensuing year. MR. J. F. MCNEAL, Watford, and MR. W. SPENCER HOWELLS, Richmond, have been re-elected vice-president and treasurer respectively.

MR. CHARLES H. CLAXTON, a member of the Institute of British Foundrymen, has been appointed a director of Thomas Hill-Jones, Ltd., manufacturing chemists and grinders of chemicals for the trade, with which company he has been continuously associated since 1913, becoming successively assistant works manager and works manager.

PROF. HAROLD PERCIVAL HIMSWORTH has been appointed secretary of the Medical Research Council as from October 1, on the retirement of Sir Edward Mellanby.

MR. FRANK KENDRICK (above, left), who has been connected with the manufacture of penicillin from its beginning, and MR. JOHN F. O'MALLEY, sales warehouse superintendent, were recently presented with their portraits by MR. C. G. WENYON, works manager, at the Trafford Park Works of I.C.I., Ltd., in the presence of members of the works council. The portraits will form part of the collection of 56 which were originally commissioned for advertisements appearing between 1941 and 1946 with the object of revealing the service of various departments of the I.C.I. organisation. Mr. F. A. Kendrick's responsibility, in the first small-scale plant at the Blackley Works, was to extract the drug by means of solvents, concentrate the extract, and then isolate it in the form of its calcium salt. He is now working on a full-scale plant. Mr. J. F. O'Malley, when in charge of the finished materials stores at Blackley during the war, supervised, among his department's important work, the dispatch of bulk supplies of mepacrine for the fighting forces.

ALDERMAN NORRIE WARD, development officer of the Textile Institute, was installed as Mayor of Morley, Yorkshire, last week at a ceremony at which several of the principal officers of the Textile Institute were guests.

SIR WALTER BENTON JONES, Bart., has been appointed chairman and MR. LESLIE O'CONNOR vice-chairman of the British Association of Coke Oven Tar Producers.

Fertiliser Research

Scope of Canadian Tracer Studies

A GRANT of $20,000 to the University of Saskatchewan for plant food research, using radioactive tracer techniques, has been announced by the Consolidated Mining and Smelting Co. of Canada, Ltd. Dr. J. W. T. Spinks, head of the university's department of chemistry, will conduct the research, which will seek information on the use of phosphate fertiliser on the Canadian prairies, establish ways of modifying present fertilisers or developing new ones better suited to soil and crop conditions, and develop the use of radioactive tracers in Canada and train a staff in the techniques of their use.

Dr. Spinks won his Ph.D. at London University in physical-chemistry. He is a fellow of the Royal Society of Canada and one of the pioneers in the radioactive tracer work. During the war he did considerable work in the Chalk River atomic energy developments.

Under the terms of the grant, the university will employ at least two qualified scientists who will devote full time to the research problems. It is expected there will be five main investigations:

To examine the efficiency of ammonium phosphate fertilisers in various soils and with various crops; to study the effect of small additions of elemental sulphur in phosphate fertilisers; to consider the placement of fertilisers, to compare various phosphate carriers; and to develop methods of measuring surface phosphate in soils.

The project will be directed by a joint committee of the university's department of chemistry under the chairmanship of Dr. Spinks and the department of soils under Dr. Dione. It will continue in force for two or three years.

CANADA'S URANIUM

ADDRESSING a recent meeting of the Canadian Prospectors' and Developers' Association on "Some Aspects of Ontario Mining," the Hon. H. C. Rickaby, Deputy Minister, Ontario Department of Mines, said that Canada faces the possibility of becoming the prime source of uranium in the world in the not too distant future.

Referring to the Theano Point discovery, he said that as it was made in granite, many people would have to re-assess their outlook regarding the best place to prospect for radioactive materials. He pointed out that many of these rocks (granites) were old sediments and volcanics which had been considerably altered to gneisses and schists, and that a large area of Ontario was underlaid by them.

Next Week's Events

MONDAY, JUNE 13

Institution of Gas Engineers. London: Institution of Civil Engineers, Great George Street, S.W.1, 3.0 p.m. 86th annual general meeting; 3.25 p.m. Presidential address by E. Crowther; 4.0 p.m. R. W. Hendee, President American Gas Association: "Peak Load Problems in the United States."

TUESDAY, JUNE 14

Electrodepositors' Technical Society. (Midlands Centre) Nottingham: Victoria Hotel, Mansfield Road. Joint meeting with Sheffield and N.E. Centre, 1.0 p.m. Lunch, followed by tour of polishing, plating and enamelling departments of works of Raleigh Industries, Ltd. 6.30 p.m. T. Parry: "Plating and Finishing of Cycle Components."

Institution of Gas Engineers. London: Institution of Civil Engineers, Great George Street, S.W.1. 10 a.m., address by A. E. Sylvester, chairman, The Gas Council. 11.15 a.m., D. G. Rose: "A Background to Some Economic Problems in the Gas Industry"; 12.45 p.m., luncheon, Savoy Hotel; 3.15 p.m., symposium of short papers; 8.0 p.m., reception and dance, Connaught Rooms, W.C.2.

WEDNESDAY, JUNE 15

International Gas Union. London: Institution of Civil Engineers, Great George Street, S.W.1. 4th International Gas Conference (three days). Discussions, reports from British delegates and overseas visitors, tours, visits to works and social activities.

THURSDAY, JUNE 16

The Royal Society. London: Burlington House, Piccadilly, W.1. 4.30 p.m. E. Laurmann and D. Schoenberg: "Penetration of Magnetic Fields into Superconductors, II"; S. Devons and M. G. N. Hine: "The Angular Distribution of Gamma Radiation from Light Nuclei."

FRIDAY, JUNE 17

Society of Leather Trades' Chemists. (London and Home Counties Group). London: Leathersellers' Technical College, 176 Tower Bridge Road, S.E.1., 2.15 p.m. Dr. F. H. Kroch and P. N. Taylor: "Some Influences of Dispersion and Grinding on the Properties of Leather Pigment Finishes"; R. Winfield: "The Manufacture of Dyestuffs."

SATURDAY, JUNE 18

International Commercial Fair, Lille (until July 3).

India's Coal and Steel

Resources and Price Controls

PROBLEMS concerning the metallurgical grades of coal in India have been summarised in a nine-point questionnaire drawn up by the Conservation of Metallurgical Coal Committee which recently held its first meeting in Calcutta, under the presidency of Mr. M. S. Krishnan.

A detailed description of seams, tonnage recovered from each, and the estimated quantity that could be extracted economically from them were some of the main points on which information was sought. The questionnaire has been sent to professors of geology and metallurgy in various universities and opinions invited from coal producers.

The average overall increase of about Rs.18 per ton on the existing schedule of retention prices of steel in India, announced to take effect from May 1, will remain in force for two years up to April 30, 1951.

This is announced in a Government of India resolution on the report of the Tariff Board on the fair retention prices of steel produced by Tata Iron and Steel Co. and the Steel Corporation of Bengal.

According to the resolution, the Government proposes to fix a schedule of prices for all controlled categories of steel. The prices will be common to both producers. The prices of certain uncontrolled categories of steel, such as sleepers, wheels and tyres, axles and acid steel plates, are also brought under control with effect from May 1, at the prices recommended. The overall increase will also include the addition for the extra cost of smelting.

The period of two years for the continuation of the increase is announced because the Government thinks it desirable to have some stability in price and enable both companies to carry out reorganisations.

Modernised Salt Industry

The salt industry, from which a large portion of Ceylon's revenue is derived has long been in a backward state.

First steps in modernisation of equipment and methods were taken recently when Mr. G. G. Ponnambalam, Minister of Industries and Industrial Research, switched on the electric power installations at the Palavi saltern.

Mr. E. B. Tisserverasinghe, Ceylon's salt commissioner, said that a comprehensive scheme for the exploitation of sea water for the manufacture of salt, and modern methods for increasing production were being considered by the Government.

The Pakistan Market

Openings for U.K. Exporters

FROM the point of view of the United Kingdom exporter, the most important advance made by Pakistan in the last 12 months has been in her import trade, which has shown a marked expansion, states the U.K. Senior Trade Commissioner there in an article in the current *Board of Trade Journal*.

United Kingdom exports to Pakistan under the classification of "chemicals, drugs, dyes and colours," in the period April to December, 1948, amounted to £1,334,000; "non-ferrous metals and manufactures thereof" in the same period reached £591,000. The total of all U.K. merchandise exported to Pakistan in this period was valued at £16,288,000.

Machinery Needs

Although industrial development in Pakistan has been disappointing, states the article, there are nevertheless inquiries for miscellaneous machinery of all types for such industries as match-making, hosiery, soap manufacture, etc., and the survey now being made on behalf of the Government of Pakistan of the vegetable oil resources of that country should eventually mean a demand for oil pressing machinery.

There is also a likely requirement, in the planned agricultural development, for spraying machinery, insecticides, etc., and if the building of other industries goes according to plan a demand may be expected for such things as instruments and apparatus, dyestuffs and paints. Items which are in great demand include chemicals and pharmaceuticals, toilet goods and medical requisites.

Shortage of technical assistance is regarded as one of the factors holding back industrial development in Pakistan and, despite certain concessions on depreciation and taxation of the dividends of new industrial undertakings, current rates of taxation are still heavy enough to tend to discourage investors.

Duty Exemptions

The Treasury has made an Order under Section 10 (5) of the Finance Act, 1926, exempting the chemicals specified below from Key Industry Duty for the period beginning June 11 and ending June 30, 1949.

Derivatives of urea—iso-amyl ethyl barbituric acid; sodium iso-amyl ethyl barbiturate; barium manganate; compounds of cerium—crude cerium sodium sulphate; cobalt arsenate; dichlor-hydrin; epichlorhydrin ("The Safeguarding of Industries (Exemption) No. 4 Order, 1949").

Home News Items

Textile Technologists.—This year's entries for the Textile Institute's annual examination in General Textile Technology number 149, a record. Last year there were 114; the highest pre-war total in one year was 48.

British Tyre Exports Increase.—Half-a-million more tyres were exported from Britain in the first four months of 1949 than in the corresponding period last year. Rather more than half the total of 3,937,946 were on the £49 million worth of vehicles sent overseas between January and April. Tyres and tubes worth £4,759,705 were shipped direct.

New Electronics Centre.—New electronics showrooms were opened by Cinema-Television, Ltd., and Dawes Instruments, Ltd., on June 1, at 83 Piccadilly, London, W.1, where, from 9 a.m. to 12.30 p.m. and from 1.30 p.m. to 5.30 p.m., Monday to Friday inclusive, will be on view a wide range of instruments, including atomic equipment.

Tankers in Trouble.—Two tanker vessels operated by the Anglo-Saxon Petroleum Co., Ltd., were involved in serious mishaps last week. On May 30 the *Naculana* (8179 tons), bound for the Persian Gulf, was reported aground off Baldayos, near Corunna, and on May 27 the tanker *Ormer* (1357) was badly holed in collision in the Mersey shortly before midnight. Her fuel oil cargo next day was being transferred to a coastal tanker.

"The Pest House."—The bicentenary of Dr. Edward Jenner, "father of vaccination," has been celebrated by the unveiling at Cheltenham of a plaque at Alpha House commemorating the fact that here the doctor fought for recognition of his, then, unpopular theory and treated hundreds of whom came for free vaccination at his hands. The building, which 200 years ago was dubbed "The Pest House," is now the main works office of Spirax Manufacturing Co., Ltd., and its associates, Sarco Thermostats, Ltd.

Building Certificate Dispensed With.—Applications to local planning authorities for permission to make small extensions to industrial buildings no longer require a Board of Trade certificate. New Board of Trade regulations, which took effect on June 1, provide that, irrespective of the size of the original building, any extensions which do not aggregate more than 5000 sq. ft. of floor space over any period of three years since July 1, 1948, will not require a Board of Trade certificate.

Scientific and Technical Appointments.—There are more than 5100 names on the scientific and technical register of the appointments department of the Minister of Labour, while the number of vacancies at the present time is around 4700.

American Interest in Scottish Distilling.—Prospects that distilling may restart in the Bathgate area, once an important distilling centre but relatively inactive in recent years, are revived by a report that an American company has acquired an option on bonded stores in the area and plans to go ahead with distilling immediately authority is given.

New Widnes Laboratories.—New laboratories were recently opened at the West Bank Works, Widnes, of W. J. Bush & Co., Ltd., the ceremony being preceded by a luncheon given by the management to members of the staff and their wives. The new building comprises both research and works departments.

Overcome By Sewer Fumes.—Two men, who descended a shaft in Pinkston Road, Glasgow, last week to trace fumes coming from a sewer, collapsed. Policemen who came to their aid were also overcome. Eventually all were rescued and taken to the Royal Infirmary for treatment. The fumes were suspected to have originated in a nearby chemical factory.

Rising Chemical Production.—The acceleration in 1949 of the rate of output of the chemicals and allied trades is reflected in a current analysis of the Central Statistical Office. This, taking 1946 output as representing 100, shows that the equivalent figure for chemical and associated products rose from a monthly average in 1947 of 105 to 133 in February this year. The comparable figure for January was 128 and for the last quarter of 1948 it was 124.

Gamma Rays for Industry.—The importance thought to attach to the employment of radioactive materials in industry, is stressed in a paper dealing with the supply and use of radium and radio for industrial radiography, eleven thousand copies of which are being distributed to trade associations, professional institutions and research centres by the Ministry of Supply. Circulation of the paper follows greater production of radium and radon at the Government-owned Radiochemical Centre, Amersham, Bucks, as a result of which, more extensive use of gamma radiography as an inspection aid to industry is possible.

Herring Oil Expansion

Another Reduction Plant at Tarbert

A NEW herring reduction factory for the production of oil and meal is to be established at Tarbert by the Herring Industry Board. Latest figures of meal and oil production from herring, given by the Secretary of State for Scotland, show that last year some 4000 tons of feedingstuffs were produced from this source. It is planned to step up production until 1952, for which year a target of 30,000 tons has been set.

The 1948 production of oil from herring was 1500 tons; the target for 1952 is 15,000 tons. These developments implement the Herring Industry Board's policy of making the best economic use of the available catch as against the older policy of restricting catches in order to maintain market prices, mainly of sales for food.

The conversion programme has initiated a new industry of considerable magnitude in Scotland, and new plants are planned for the main herring landing ports.

MORE FATAL ACCIDENTS

THE numbers of fatal industrial accidents and of deaths from industrial diseases in April are reported in the *Ministry of Labour Gazette* (Vol. LVII, No. 5, May, 1949).

Deaths from accidents in the course of employment in the United Kingdom were 121 in April compared with 116 in the previous month and 142 in April, 1948. In chemicals, oils, and soaps, etc., there were only four fatal accidents, while metal conversion accounted for eight and other metal trades two.

Cases reported under the Factories Act, 1937, or the Lead Paint (Protection against Poisoning) Act, 1926, in the U.K. in April showed five deaths, one from lead poisoning in the white and red lead works, and four due to epitheliomatous ulceration (skin cancer) in the oil industry. There were in all 43 cases coming within the scope of the two Acts.

I.C.I. Research

An exhibition of publications issued by Imperial Chemical Industries, Ltd., setting out results of their research work, is to be opened by Sir Frederick Bain at the Grosvenor Hotel, London, S.W., on June 13.

The publications, which range from single sheets to complete books, are distributed free, and play an important, if not much publicised, part in the company's technical services to industry.

French Oil Agreement

Two Principal Groups to Collaborate

AN important agreement has recently been signed between Campagnie Française de Raffinage and the Standard Française des Pétroles regarding technical and commercial co-operation between these two leading French oil refining companies. It may be recalled that the Compagnie Française de Raffinage is a subsidiary of the Compagnie Française des Pétroles which administrates the French holding in the Iraq Oil Company, which, as a result of an arrangement made in 1930 with the French Government, controls over a quarter of the French oil market. The Standard Française des Pétroles is a subsidiary of the Standard Oil Company, of New Jersey.

Three Refineries

The Compagnie Française de Raffinage operates two refineries, one in Gonfreville, near Le Havre, and another in La Mède, near Marseilles. The combined intake of these two plants totalled last year about 2.6 million tons of crude oil. The Standard Française operates a refinery at Port-Jérôme, near the Seine estuary, with an annual intake of 1.4 million tons.

Both companies are at present engaged in an expansion of their refining capacity under the Monnet Plan. The new agreement is to make it possible for the two companies to concentrate their investments in such a way that the Compagnie Française de Raffinage will expand its Mediterranean plant and the Standard Française that on the Seine Estuary. It also provides for a mutual exchange of refining capacity.

The advantages of the agreement are to be found in the better adjustment of production programmes to market requirements, leading to improved distribution and lower costs. In addition, the Standard Française will be in a position to refine its increasing supplies of Middle Eastern crude oil in a Mediterranean plant, instead of having to transport it across France to Port-Jérôme.

In the meantime, the Standard Française has undertaken to purchase a quarter of the needs of its distributing organisation from the plant of the Compagnie Française de Raffinage, at La Mède. While this agreement is of considerable importance to the French oil industry, its significance from the international point of view lies in the fact that the Compagnie Française des Pétroles, which has always guarded its independence of the large foreign oil groups, has agreed upon a co-operation with the leading U.S. oil group.

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *— followed by the date of the Summary, but such total may have been reduced.)

ANTI-MISTANT, LTD., Sidcup. (M., 11/6/49.) April 20, charge, to Bradford Equitable Building Society securing £1500 and further advances; charged on property formerly known as The Rectory, North Cray Road, North Cray, Sidcup. *Nil. September 6, 1946.

BRITISH LIGNITE PRODUCTS, LTD., Bovey Tracey. (M., 11/6/49.) April 14, £69,000 charge and a debenture by way of further security thereto, both to George Wimpey & Co., Ltd.; respectively charged on land at Bovey Tracey with buildings thereon known as Devon House of Mercy and the infirmary and adjoining land, and a general charge. *Nil. December 7, 1948.

DIAZOPOL DYE & CHEMICAL CO., LTD., Radcliffe. (M., 11/6/49.) April 19, mortgage, to District Bank, Ltd., securing all moneys due or to become due to the bank; charged on land at Rishton with warehouse or storehouse thereon. *Nil. December 23, 1947.

GLYSAN PRODUCTS, LTD., London, E.C. (M., 11/6/49.) April 22, mortgage and charge, to Midland Bank, Ltd., securing all moneys due or to become due to the bank; charged on lands, hereditaments and premises known as Warfleet Brewery, Dartmouth.

HIGHER SPEED METALS, LTD. (formerly MACKERETH & CO., LTD.), Sheffield. (M., 11/6/49.) April 27, debenture, to Barclays Bank, Ltd., securing all moneys due or to become due to the bank; general charge. *Nil. March 31, 1948.

MANCHESTER OIL REFINERY, LTD. (formerly REFINERY (HOLDINGS), LTD), London, E.C. (M., 11/6/49.) April 21, mortgage and debenture, to District Bank, Ltd., securing all moneys due or to become due to the bank; floating charges on certain book debts, all securities, oil stocks and other assets.

REYNOLDS SCIENTIFIC GLASS WORKS, LTD., London, S.W. (M., 11/6/49.) May 3, mortgage, to National Provincial Bank, Ltd., securing all moneys due or to become due to the bank; charged on 53 Hanworth Road, Sunbury, with plant, fixtures, etc., thereon. *— February 22, 1948.

TECHNICAL DIAMONDS, LTD., Bangor. (M., 11/6/49.) April 13, debenture, to Lloyds Bank, Ltd., securing all moneys due or to become due to the bank; general charge. *Nil. July 10, 1947.

Satisfactions

ALLIED INSTRUMENT MANUFACTURERS, LTD., London, N.W. (M.S., 11/6/49.) Satisfaction May 4, of mortgage registered August 6, 1940.

DESPEL CHEMICAL CO., LTD., Preston. (M.S., 11/6/49.) Satisfaction May 6, of debenture registered March 8, 1948.

J. EVERSHED & SON, LTD., Brighton. (M.S., 11/6/49.) Satisfactions May 4, of charge registered September 11, 1946

LIQUIDS CONTROL, LTD., London, N.W. (M.S., 11/6/49.) Satisfaction May 3, of debenture registered April 22, 1948, to the extent of £3100.

V. P. SHEET METAL, LTD., Cheltenham. (M.S., 11/6/49.) Satisfactions May 4, of debenture registered December 4, 1946, and charge registered March 3, 1948.

New Companies Registered

G. & S. G. Neal, Ltd. (468,972). Private company. Capital £2000. Pest controllers and contractors for spraying by machinery of land and growing crops, etc. Directors: G. Neal and S. G. Neal, both of "The Gables," Whaplode, Spalding, Lincs.

Resinous Chemicals, Ltd. (468,992). Private company. Capital £100. Manufacturers of synthetic resins, drying oils, plasticisers, chemical preparations, paints, oils, etc. Directors: J. F. Chapman and J. S. Tempest. Reg. office: 3 Scarborough Street, West Hartlepool.

Whitfields (Crichton), Ltd. (468,803). Private company. Capital £500. Manufacturing chemists, etc. Director: J. M. Crichton. Reg. office: 36 St. Nicholas Street, Scarborough.

Chemical and Allied Stocks and Shares

HOME and international political developments again combined to influence a price recession in the stock markets.

Markets have also been affected by persistent rumours that sterling is likely to be devalued, regardless of the belief in the City that this would be a last resort if exports

a new technique against

CORROSION

Following the announcement* by D.S.I.R., Teddington, of a new method for preventing corrosion, Monsanto offers technical service and advice on the use of SODIUM BENZOATE B.P., for this purpose. Here are some of the main applications:

PAPER WRAPPINGS For wrapping metal parts, paper impregnated with Sodium Benzoate dispenses with the use of grease or wax, and gives protection even in tropical conditions.

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HEAT EXCHANGERS, EVAPORATORS Added to liquid medium, Sodium Benzoate stops corrosion, reduces heat loss, but does not remove scale. Gives protection to soldered and welded joints as well as to metal body.

ROAD TRANSPORT Used in radiator mixtures, Sodium Benzoate stops scaling, assists anti-freeze action by depressing freezing point.

STRIP METAL STORAGE Metal stored in Sodium Benzoate solution will stay clean and bright for long periods.

SEMI-PROCESSED PARTS Metal components in process can be protected from corrosion by storing in Sodium Benzoate solution.

RUBBER LATEX With the incorporation of a small proportion of Sodium Benzoate, Rubber Latex may be applied, either by dipping or spraying, as a protective coating to metal parts to prevent corrosion during storage. The Sodium Benzoate is easily incorporated and it is water soluble.

* "*Journal of Soc. of Chem. Industry.*" *Vol. 66, No. 5. pp. 138/139.*

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to the dollar countries continued to dwindle. Devaluation of sterling would of course involve a big increase in the cost of imports of essential raw materials.

Shares of chemical and allied companies moved back again with the general market trend, and declines have been no larger than in industrial securities generally. Sentiment is affected by the view that, owing to growing competition in export markets, many companies may be unable to keep earnings at 1948 levels. On the other hand, in most instances there would have to be a very heavy profit fall to necessitate lower dividend payments.

Many companies are planning substantial increases in capital in order to finance the purchase of new plant and materials, which are essential if production costs are to be reduced. It is an ironical commentary on existing conditions that if taxation had not been at its present appalling level, most of these companies would be in a position to finance their new plant and equipment requirements without the issue of new capital.

From the point of view of the Stock Exchange, however, new issues provide a big competitor, because in most cases the new shares are offered to shareholders on attractive terms, and shareholders, to take advantage of these offers, are prone to sell holdings in other companies.

At the time of writing, Imperial Chemical have come back to 44s. 6d. with the general trend. The City was stimulated by Lord McGowan's remarks at the recent annual meeting regarding rumours of intended nationalisation of I.C.I., Ltd. Albright & Wilson, awaiting terms of the projected £1 million issue, were back to 28s. 6d. Amber Chemical 2s. shares eased to 6s. 7½d. following the results, and Brotherton 10s. shares were 20s. 3d. Levers have receded further to 45s. and there was some selling of Lever N.V. which declined to 41s. 1¼d. There is uncertainty here how earnings would be affected in the event of currency devaluation. There was, on the other hand, a fairly steady tendency in Borax Consolidated (52s. 6d.) and in shares of other companies with interests in the U.S. because the sterling value of their income from the latter would be enhanced in the event of sterling devaluation.

With markets in their present uncertain state, even shares considered to have bonus prospects also lost ground, including Glaxo Laboratories, which have declined to £19, compared with £22 recently. It should not be overlooked, however, that the reaction in stock markets has been due more to extreme caution on the part of buyers than to selling, which has not been exceptionally heavy.

Oils lost ground in accordance with the general trend, although Shell at 61s. 3d. steadied in advance of publication of the full report and accounts.

British Chemical Prices

Market Reports

DESPITE the shorter holiday week, an active interest continues to be maintained in the industrial chemicals market and buying orders both for home and overseas destinations have been plentiful. The supply position is generally easier and dealers are having no difficulty in offering firm delivery dates. Practically all the soda and potash compounds are enjoying a steady movement with consumers' delivery specifications covering good volumes. Industrial (ethyl) alcohol, butyl alcohol, acetic anhydride and acetic acid are now released from control and revert to private trade. The demand for the lead and zinc compounds has been steady at the lower price levels and an active inquiry is reported for other non-ferrous metal products. Among the coal-tar products there has been a fairly active demand for creosote oil, carbolic acid and the pyridines but elsewhere the market is quiet with quotations remaining at recent levels.

MANCHESTER.—Seasonal holiday influences have been strongly in evidence on the Manchester chemical market during the past week, the majority of the textile and other chemical-using establishments in the Lancashire area having been closed for varying periods. This has had its effect not only on the volume of new business booked but also on the movement of supplies to consumers under existing orders. However, a full return to normal trading conditions is looked for at the beginning of next week. In the meantime, the undertone in most sections of the market is steady, though there are still a number of chemicals where the tendency is easy.

GLASGOW.—There has been a little heavier buying during the past week in the Scottish chemical market, although a certain amount of it has been due to buyers taking in larger stocks than usual, in recognition of the possibility of a rail strike. Apart from this, the market has shown nothing of interest to report. The export market has been more active, with import licences now coming in again from Portugal. There has also been extra activity endeavouring to ship materials to South Africa before the commencement of the import ban.

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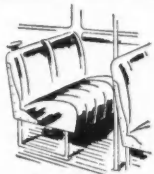
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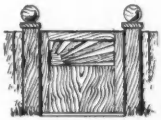
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Patent Processes in Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Production of oil-modified alkyd resins and coating compositions prepared therefrom.—British Resin Products, Ltd., E. M. Evans, E. M. Riley, and L. R. Anthony. July 26, 1946. 619,975.

Corrosive protective compositions.—A/B. Hassle, Apotekare Paul Nordstroms Fabriker. Sept. 5, 1945. 620,056.

Electrical vibrometers.—Metropolitan-Vickers Electrical Co., Ltd., and R. B. Smith. Aug. 19, 1946. 620,166.

De-ironing of chromium ores.—Soc. d'Electro-Chimie, d'Electro-Metallurgie et des Acieries Electriques d'Ugine. Dec. 13, 1943. 619,886.

Method of and apparatus for manufacturing light-weight aggregate for concrete.—A. Ryner. (American Aggregate Co., Inc.) Aug. 23, 1946. 619,888.

Processes for the treatment of hydrocarbons containing acidic or phenolic substances.—Laboratoire de Recherches Industrielles (Michot-Dupont). March 20, 1942. 619,776.

Process for the manufacture of pentanes.—Roche Products, Ltd. (F. Hoffman-La Roche & Co., A.G.) Sept. 24, 1946. 619,898.

Iron powder and cores produced therefrom.—General Aniline & Film Corporation. Jan. 18, 1946. 619,779.

Process of separating progesterone from cholesterol.—Laboratoires Français de Chimiotherapie. Nov. 15, 1945. 619,982.

Chromium-nickel stainless steels.—Alloy Research Corporation. Oct. 23, 1945. 620,174.

Casting of metals.—Metropolitan-Vickers Electrical Co., Ltd., L. E. Benson, and J. S. Turnbull. Nov. 6, 1946. 619,991.

Curing of polyethylenes.—E. I. Du Pont de Nemours & Co. Oct. 27, 1945. 619,905.

Alloy steels for use at elevated temperatures.—L. Rotherham, C. Stokes, and C. Sykes. Nov. 18, 1946. 619,912.

Pyrimidine derivatives.—I.C.I., Ltd., and G. R. Ramage. Nov. 27, 1946. 619,915.

Separation of impurities from materials by froth flotation.—W. R. Chapman. Dec. 2, 1946. 619,918.

Producing or refining metals.—International Alloys, Ltd. Dec. 20, 1946. 620,071.

Coal-mining machines of the cutter-loader type.—Anderson, Boyes & Co., Ltd., and A. Anderson. Dec. 28, 1946. 619,805.

Grid or grating for use in the production or treatment of gases.—J. King, Jun., and J. E. Wakeford. Dec. 30, 1946. 619,819.

Process for the production of zein and sclutions thereof and zein-containing prolamines. Manbre & Garton, Ltd., B. P. Baker, and N. A. C. Pryce. Jan. 1, 1947. 620,011.

Apparatus for the extraction of oil from vegetable and animal products.—L. H. Manderstam, L. W. Warner, and P. H. Wilson. Jan. 2, 1947. 620,021.

Apparatus for making coiled yarn.—United States Rubber Co. Feb. 5, 1946. 620,15.

Methods of making seamless tubes.—United States Rubber Co. Jan. 19, 1946. 620,106.

Welding of dielectric plastics.—Applied High Frequency, Ltd., E. G. Autie, and F. W. Johnes. Jan. 7, 1947. 620,196.

Automatic electric welding system.—Linde Air Products Co. Feb. 5, 1946. 620,198.

Manufacture of α : α-di-(aminophenyl)-β : β : β-trichlorethanes.—R. H. Hughes. (J. R. Geigy, A.G.) July 3, 1946. 620,114.

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SITUATIONS VACANT

None of the vacancies in these columns relates to a man between the ages of 18 and 50 inclusive, or a woman between the ages of 18 and 40 inclusive, unless he or she is exempted from the provisions of the Control of Engagement Order, or the vacancy is for employment exempted from the provisions of that order.

APPLICATIONS are invited by the Ministry of Supply for the following appointment in the Division of Atomic Energy (Production) Windscale Works, Sellafield, Cumberland.

Assistant Manager (Production) to be responsible to the Production Manager for the operation of a large chemical plant. The successful candidate will be stationed initially at Risley, Nr. Warrington, for two years to assist on development work for the factory. Candidates must have an honours degree in Chemistry or Chemical Engineering, or Associateship of the Royal Institute of Chemistry or Corporate Membership of the Institution of Chemical Engineers. They must have had at least three years approved experience in a factory or industrial laboratory, preferably in the heavy chemical industry. They should have experience in the handling of corrosive materials, and inflammable solvents, and in precautions against toxic hazards. Experience in the management of labour will also be required. Salary will be assessed according to qualifications and experience within the range £720–£960 per annum. Candidates will normally be confined to natural born British Subjects, born within the United Kingdom or a self-governing Dominion, of parents also born in the United Kingdom or a self-governing Dominion.

Applications should be addressed to STAFF SECTION, Ministry of Supply Division of Atomic Energy (Production), Risley, Nr. Warrington.
Ri. 5709-1+20—25.5.49—AS.

APPLICATIONS are invited from Qualified Engineers, B.Sc. or A.M.I.Mech.E., for important Chemical Works, Manchester area. Applicants should not be over 40 years of age, and have experience in maintenance, chemical plant erection and design. Position offered is permanent and progressive. Only men of proved ability need apply. Address in first instance, with particulars of qualifications and experience in detail, and salary expected. Box No. 2817, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

SITUATIONS VACANT

BRITISH Oxygen Company, Ltd., require a Mechanical Draughtsman for their head office in the West End of London. Applicant should have had practical experience in the preparation of chemical works, layout drawings and site drawings. Knowledge of high pressure gas plant layout an advantage. Preference will be given to applicants who have passed Higher National Certificate. Reply giving full details of age, qualifications and experience to Dept. M.12. Box No. U 4318, A.K. ADVG., 212A, Shaftesbury Avenue, W.C.2.

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MAJOR OIL COMPANY has a number of vacancies in senior positions for experienced (a) **CHEMISTS**, (b) **CHEMICAL** and **DEVELOPMENT ENGINEERS** for their refinery in the Middle East.

(a) **CHEMISTS**—Candidates should possess an Honours Degree in Chemistry or Physics together with a minimum of five years' practical experience in works or development laboratories connected with the control and operation of large scale industrial processes.

(b) **CHEMICAL ENGINEERS**—Candidates should possess an Honours Degree or equivalent in Chemical or Mechanical Engineering and/or a Science Degree in Chemistry, together with a minimum of five years' practical experience in the design, development and operation of plant and equipment connected with large scale industrial processes.

Candidates in both the above categories should be between 27 and 35 years of age; the work will be concerned with the operation and development side of oil refinery equipment, but specialised oil experience is not essential. A knowledge and appreciation of the fundamentals of approach to scientific and technical problems associated with large scale operations is, however, essential. Applicants must also possess the necessary personality, initiative and drive, to direct the work of others, and to carry out independant investigations requiring tact and organising ability. Prospects include interesting work, scope for initiative, and good opportunities for advancement.

Commencing salaries will be between £1,000 per annum and £1,500 per annum, and will be considered in proportion to qualifications and experience of applicants; generous allowance in local currency will also be paid; married accommodation will be made available after completion of six months' satisfactory service overseas. Free passages out and home; free medical attention; kit allowance; Pension Scheme; good leave arrangements. Write, stating age and full details of qualifications and experience, quoting **Department F.150 to Box 2073 at 191, Gresham House, E.C.2.**

SITUATIONS VACANT

IMPERIAL Chemical Industries, Ltd., General Chemicals Division, Widnes, have a vacancy for a qualified Chemist to investigate potential applications and uses for their products. Candidates preferably between 30 and 40 years of age, should have had previous laboratory experience in formulating compounds by reacting, blending, converting or, in other ways, processing chemical substances. They should have a good general knowledge of chemicals or other materials suitable as reagents, intermediates, solvents, emulsifiers, softeners, fillers, plasticizers, stabilizers, wetting agents, etc.

Apply in writing, quoting R/9, and giving details of age, qualifications, experience to STAFF MANAGER, Imperial Chemical Industries, Limited, General Chemicals Division, Cunard Building, Liverpool, 3.

ROYAL BOROUGH OF WINDSOR
APPOINTMENT OF PUBLIC ANALYSIST

APPLICATIONS are invited from persons with the prescribed qualifications, or such other qualifications as the Minister of Health may approve, for the appointment of Public Analysist for the Royal Borough of New Windsor in accordance with the provisions of Section 66 of the Food and Drugs Act, 1938, as amended by Article 6 (1) (b) of the Transfer of Functions (Food and Drugs) Order 1948.

Applications stating age, qualifications and experience and the fees required, should reach the undersigned not later than the 28th June, 1949.

R. WEBSTER STORR,
Town Clerk.

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THE Midland Tar Distillers, Ltd., Oldbury, Near Birmingham require CHEMICAL ENGINEERS possessing a Degree in Chemical Engineering or A.M.I. Chem.E. Applicants must have had several years industrial experience in chemical engineering and development work. A first hand knowledge of the oil refining industry an advantage. Full particulars to PERSONNEL MANAGER.

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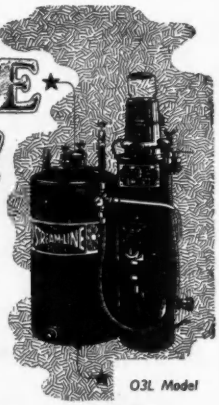

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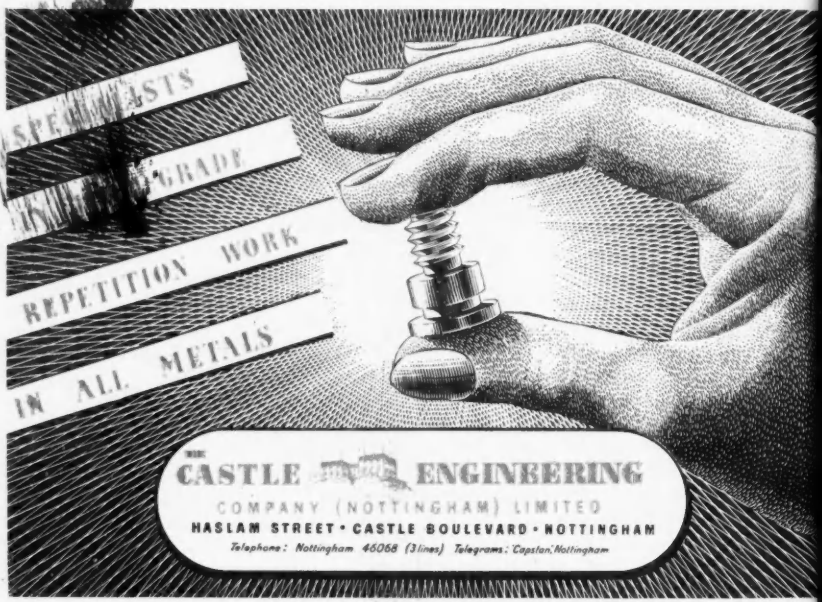

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